THE

# AMERICAN GAS-LIGHT JOURNAL.

THE OFFICIAL GAZETTE OF

**LIGHT, HEAT, WATER-SUPPLY, AND SEWERAGE.**

**Rooms—No. 39 Nassau Street, cor. Liberty Street, opposite the Post-Office, New York.**

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See engravings on page 148, vol. II.

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See Engravings on page 168, Vol. II. of this JOURNAL.

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For engravings, see American Gas-Light Journal for June, 1860, page 245. Address the Patentee. JOHN P. KENNEDY, Trenton, N. J.

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See Engravings in American Gas-Light Journal for July 1, 1860, page 280.

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Samples of the above castings can be seen at the Rooms of the American Gas-Light Journal.

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| Brady's Mill, | Mount Savage, | Summitville, |
| *Cumberland*, (c. h.,) | Oakland, | Swanton, |
| Flint Stone, | Oldtown, | Western Port, |
| Frostburgh, | | Winston. |

### Anne Arundel County.

| | | |
|---|---|---|
| *Annapolis*, (c. h.,) | Forest Home, | Patuxent, |
| Annapolis Junction, | Friendship, | Saint Margaret's, |
| Bristol, | Governor's Bridge, | South River, |
| Crownsville, | Johnson's Store, | Tracy's Landing. |
| Davidsonville, | Millersville, | West River. |

### Baltimore County.

| | | |
|---|---|---|
| *Baltimore*, (c. h.,) | Hereford, | Saint Dennis, |
| Black Rock, | Hookstown, | Shawan, |
| Buchanan, | Lauraville, | Stablersville, |
| Brooklandville, | Little Gunpowder, | Stocksdale, |
| Butler, | Long Green Academy, | Sweet Air, |
| Calverton Mills, | Lutherville, | Towsontown, |
| Chase's, | Maryland Line, | Union Meeting House, |
| Catonsville, | Monkton Mills, | Upperco, |
| Cockeysville, | Mount Washington, | Upper Falls, |
| Ellengowan, | North Branch, | Warren, |
| Fork Meeting House, | Owing's Mills, | Weisesburgh, |
| Freeland, | Paper Mills, | Westerman's Mills, |
| Gorsuch's Mills, | Parkton, | Wetheredville, |
| Grave Run Mills, | Philopolis, | White Hall, |
| Greenwood, | Pikesville, | Woodberry, |
| Govanstown, | Randallstown, | Woodensburgh, |
| Harewood, | Reisterstown, | Zoucksville. |
| | Rossville, | |

### Calvert County.

| | | |
|---|---|---|
| Dunkirk, | Port Republic, | Saint Leonards, |
| Huntingtown, | *Prince Frederick-* | Sunderlandville. |
| Lower Marlboro', | *town*, (c. h.,) | |

### Caroline County.

| | | |
|---|---|---|
| Bethlehem, | *Denton*, (c. h.,) | New Hope, |
| Boonsville, | Fowling Creek, | Potter's Landing, |
| Bridgetown, | Greensboro', | Preston, |
| Burrsville, | Hillsboro', | Smithville. |
| | Melville, | |

### Carroll County.

| | | |
|---|---|---|
| Bachman's Mills, | Hood's Mills, | Silver Run, |
| Bark Hill, | Houck's Store, | Sykesville, |
| Bird Hill, | McKinstrey's Mills, | Taneytown, |
| Bruceville, | Kroh's Mills, | Union Bridge, |
| Carrollton, | Manchester, | Union Mills, |
| Double Pipe Creek, | Middleburgh, | Uniontown, |
| Finksburgh, | Mount Airy, | Wakefield, |
| Franklinville, | New Windsor, | Warfieldsburgh, |
| Freedom, | Piney Creek, | *Westminster*, (c. h.,) |
| Hampstead, | Poolesburgh, | Winfield, |
| Harney, | Porters, | Woodbine. |
| | Sam's Creek, | |

### Cecil County.

| | | |
|---|---|---|
| Battle Swamp, | *Elkton*, (c. h.,) | Principio Furnace, |
| Bay View, | Fair Hill, | Rising Sun, |
| Blue Ball, | Farmington, | Rock Springs, |
| Bohemia Mills, | Northeast, | Rowlandsville, |
| Brick Meeting House, | Perryville, | Saint Augustine, |
| Cecilton, | Port Deposit, | South Milford, |
| Charlestown, | Port Herman, | Warwick, |
| Cherry Hill, | Principio, | Westnottingham, |
| Chesapeake City, | | Zion. |

### Charles County,

| | | |
|---|---|---|
| Allen's Fresh, | Duffield, | Pisgah, |
| Beantown, | Gallant Green, | Patuxent City, |
| Benedict, | Glymont, | Pomonkey, |
| Bryantown, | Nanjemoy, | *Port Tobacco*, (c. h.,) |
| Doncaster, | Newport, | Tompkinsville. |

### Dorchester County.

| | | |
|---|---|---|
| Airey's, | Crotcher's Ferry, | Hicksburgh, |
| Big Mills, | Draw Bridge, | Hills Point, |
| Bucktown, | East New Market, | Lakesville, |
| *Cambridge*, (c. h.,) | Federalsburgh, | Taylor's Island, |
| Cedar Creek, | Fishing Creek, | Tobacco Stick, |
| Church Creek, | Galestown, | Vienna, |
| Cornersville, | Golden Hill, | Williamsburgh. |
| | Harrison, | |

### Frederick County.

| | | |
|---|---|---|
| Adamstown, | Ijamsville, | New London, |
| Barry, | Jefferson, | New Market, |
| Bolivar, | Johnsville, | Oak Orchard, |
| Bridgeport, | Kemptown, | Petersville, |
| Buckey's Town, | Ladiesburgh, | Point of Rocks, |
| Burkittsville, | Lewistown, | Sabillisville, |
| Cotocton Furnace, | Liberty Town, | Unionville, |
| Creagerstown, | Linganore, | Urbana, |
| Emmitsburgh, | Mechanicstown, | Utica Mills, |
| Foxville, | Middletown, | Walkersville, |
| *Frederick*, (c. h.,) | Monrovia, | Weverton, |
| Graceham, | Mount Pleasant, | Wolfsville, |
| Greenfield Mills, | Myersville, | Woodsborough. |

### Hartford County

| | | |
|---|---|---|
| Abingdon, | Forest Hill, | Magnolia, |
| *Bel-Air*, (c. h.,) | Glenville, | Michaelsville, |
| Churchville, | Grey Rock, | Mill Green, |
| Cottage Home, | Hall's Cross Roads, | Perrymansville, |
| Clayton, | Havre de Grace, | Pleasantville, |
| Clermont Mills, | Harford Furnace, | Plyesville, |
| Darlington, | Hickory Tavern, | Sandy Hook, |

### Hartford County.—*Continued.*

| | | |
|---|---|---|
| Dublin, | Hopewell Cross Roads | Shawsville, |
| Emmorton, | Jarrettsville, | Taylor, |
| Fallston, | Jerusalem Mills, | Thomas' Run, |
| Federal Hill, | Lapidum, | Upper Cross Roads. |

### Howard County.

| | | |
|---|---|---|
| Alberton, | Glenelg, | Pierceland, |
| Clarksville, | Ilchester Mills, | Poplar Springs, |
| Cooksville, | Lisbon, | Savage, |
| Elk Ridge Landing, | Marriottsville, | Simpsonville, |
| Ellicott's Mills, | Matthew's Store, | Woodstock. |

### Kent County.

| | | |
|---|---|---|
| *Chestertown*, (c. h.,) | Harmony, | Rock Hall, |
| Chesterville, | Head of Sassafras, | Rogers' Store, |
| Galena, | Massey's Cross Roads, | Still Pond, |
| Hanesville, | Millington, | Urieville. |
| | Rees' Corner, | |

### Montgomery County.

| | | |
|---|---|---|
| Barnesville, | Darnestown, | Middlebrook, |
| Brookville, | Drayton, | Monocacy, |
| Burnt Mills, | Forest Oak, | Olney, |
| Clarksburgh, | Goshen, | Poolesville, |
| Colesville, | Great Falls, | *Rockville*, (c. h.,) |
| Concord, | Hyattstown, | Sandy Spring, |
| Cottage, | Laytonsville, | Triadelphia, |
| Damascus, | | Unity. |

### Prince George's County.

| | | |
|---|---|---|
| Aquasco, | Collington, | Nottingham, |
| Beltsville, | Croom, | Piscataway, |
| Bladensburgh, | Horse Head, | Queen Ann, |
| Brandywine, | Hyattsville, | Surratt's, |
| Buena Vista, | Laurel Factory, | Upper Marlboro. |
| | Long Old Fields, | |

### Queen Anne County.

| | | |
|---|---|---|
| Broad Creek, | Crumpton, | Sudlersville, |
| *Centreville*, (c. h.,) | Long Marsh, | Templeville, |
| Church Hill, | Queenstown, | Wye Mills. |
| | Roesville, | |

### St. Mary's County.

| | | |
|---|---|---|
| Chaptico, | *Leonardtown*, (c. h.,) | Ridge, |
| Charlotte Hall, | Milestown, | St. Clement's Bay, |
| Great Mills, | Mount Olive, | St. Inigoes. |
| | Oakville, | |

### Somerset County.

| | | |
|---|---|---|
| Barren Creek Springs, | Kingston, | Sharptown, |
| Crow's Mills, | *Princess Ann*, (c. h.) | Shelltown, |
| Dame's Quarter, | Quantico, | Tyaskin, |
| Deal's Island, | Roachville, | Upper Trappe, |
| Fork Town, | Salisbury, | Whitehaven. |

### Talbot County.

| | | |
|---|---|---|
| Bay Hundred, | Oxford, | Saint Michaels, |
| Chapel, | Royal Oak, | Skipton, |
| *Easton*, (c. h.,) | | Trappe. |

### Washington County.

| | | |
|---|---|---|
| Bakersville, | College of St. James, | Keedysville, |
| Beaver Creek, | Downsville, | Lappon's Cross Roads, |
| Benevola, | Fair Play, | Leitersburgh, |
| Boonsboro', | Fairview, | Millstone Point, |
| Brownsville, | Four Locks, | Ringgold, |
| Cavetown, | Funkstown, | Rohrersville, |
| Chewsville, | Green Spring Furnace | Sharpsburgh, |
| Clear Spring, | *Hagerstown*, (c. h.,) | Smithsburgh, |
| Conococheague, | Hancock, | Williamsport. |
| | Indian Springs, | |

### Worcester County.

| | | |
|---|---|---|
| Berlin, | Newark, | Saint Martins, |
| Bishopsville, | New Town, | Sandy Hill, |
| Derickson's Cross Roads, | Powelville, | *Snow Hill*, (c. h.,) Whaleysville. |

## ANOTHER £2,000 WANTED.

We have done so much towards keeping Mr. Samuel Hughes's name constantly before the public, that we considered ourselves entitled to his warmest thanks. We have, whenever an opportunity presented itself, set forth his ingenuity, his assiduity, his cleverness, his self-confidence, and other qualities which make him a capital agitator; and we have shown also that he knows how to appreciate his own services when making out his "little bill." We have done our best to advertise his claims to be employed by all who are seeking out for grievances, and wish to get up a case against gas companies. But what we have done to serve him in this matter seems to be insufficient for his purpose. He is so greedy of notoriety that it is difficult to satisfy him, and he now wishes his friends and the public to subscribe another £2,000, in addition to the large sums which they have already expended in giving him publicity during the proceedings in promoting the Metropolis Gas Regulation Act. He is anxious to have an organ of his own for the expression of his opinions, and thus to advertise himself more constantly, and more in his own fashion than we have done, and he has accordingly issued a circular addressed to certain parties whom he hopes may be induced to promote that object. Though directed against us, we shall not resent his ingratitude by withdrawing our patronage from him, but will aid his endeavors by giving the circular additional publicity in our columns:

[COPY.]

14 *Park Street, Westminster, S. W., June* 17, 1861.

My Dear Sir,—An association has been formed in London for the purpose of establishing a weekly magazine of high character, to be devoted to gas, water, and sanitary subjects.

One great object is, to have a fair and full representation of all these important interests alike, as regards producers, consumers, local authorities and others.

We hope, by a fair and upright advocacy of everything meritorious in these departments, to counteract the debasing influence now exercised by a certain journal, which is constantly endeavoring, amongst other things, to depreciate all professional men not belonging to its own clique; and perpetually imputating to them unworthy and improper motives.

The expense of establishing the magazine will probably be about £2,000, which it is proposed to raise by a sort of joint-stock limited liability.

There is to be a meeting on the subject at 2 P. M., on Tuesday, the 25th of June, at the office of Messrs. Marriott and Jordan, parliamentary agents, 22, Parliament street, when I shall be very happy if you can attend. If this be not possible, will you kindly communicate with me in the course of this week, saying whether you feel disposed to take any interest, of a pecuniary nature or otherwise, in this matter? If you do not wish to become a shareholder, I hope we may, at all events, rely on your support in the way of contributing articles.

I remain, dear sir, yours very truly,

(Signed) SAMUEL HUGHES.

Messrs. Marriott and Jordan, the gentlemen under whose auspices this project has been concocted, are well known to be the agents of Messrs. Glover, and of the other parties who are endeavoring to defeat the amendment of the Sale of Gas Act; and, it may be inferred from the circular, that a league has been formed between that party and Mr. Hughes for mutual purposes. Who the other parties invited to join the conference may be, we shall perhaps learn in time. Some of them, indeed, might be pointed out by inference, for the meeting would assuredly have been incomplete without the presence of Mr. Flintoff, the founder of the school of which Mr. Hughes is a recent *élève*. He is an old client of Mr. Marriott, who canvassed not long ago in his behalf when he was a candidate for a public appointment, and his previous literary renown would render him a fitting associate in such an undertaking. He can also point to the almost fabulous savings he claims to have been the means of effecting in a long array of towns, while his pupil's chief claim upon the gratitude of his metropolitan friends consists in a rise of 10 per cent. in the price of gas to private consumer in the eastern districts, and an increase in the charge for public lights in other districts; for those have been the substantial results of the metropolitan gas agitation, in which Mr. Hughes played so important a part.

The circular we have printed was not addressed to us; and, not having been invited to attend the meeting, we have no positive knowledge of what was said and done; but, it may be safely assumed that we were honored with special notice, and that our "clique," comprising all the respectable portion of the engineering profession, came in for their share of comment.

The "great object" which the Hughes and Glover "cliques" profess to have in view is, as we have seen, to be accomplished by raising £2,000 "by a sort of joint-stock limited liability." The exact kind of liability which the shareholders would have to incur does not seem to be settled, and it will require all Mr. Hughes's ingenuity to devise "a sort of limited liability" that will protect them from actions for libel, and the other responsibilities that the proprietors of a public journal have to bear beyond the ordinary risks of a trading company. The minor consideration of personal risk may, however, be regarded as insignificant when the object to be gained is "a fair and upright advocacy of everything meritorious;" and, could we feel assured that the object would be accomplished, we might perhaps, be induced to take shares in the undertaking. Though Mr. Hughes professes to be angry and at enmity with us, the project may be intended for our benefit, as experience has proved that two may thrive where one has starved; and we are old enough to remember how rivalry increased our usefulness, and strengthened our hands. Can it be that Mr. Hughes intends, in this way, to repay the obligation he is under to us for having so frequently advertised him gratuitously? Should this be his motive, it is an ungracious act to use Messrs. Glover and Co. as his cat's-paw, and to make them pay the expense. The advantage to be gained by a short lived attempt to maintain the Sale of Gas Act can scarcely be worth sinking £2,000, under any circumstances; and it is quite certain that, if the proposed magazine did really carry out the profession of "a fair and upright advocacy of everything meritorious," those who are now most desirous to establish such a periodical, would be quite as much incensed by its observations as they are with "a certain journal" under whose lash they writhe—*Journal of Gas-Lighting.*

## WATER-WORKS OF AMERICA.

### PROPOSED WATER SUPPLY FOR NEWARK, N. J.

On the 11th of September, 1860, the Newark Aqueduct Board adopted a resolution to the effect that the Engineer of the Board be directed to make preliminary examinations and surveys of localities, &c., with reference to procuring an increased supply of water for the city of Newark. GEORGE H. BAILEY, Esq., the able engineer, having completed his examinations in pursuance of this resolution, his report is before us, presenting much valuable information on the subject. The vital importance of an unlimited, wholesome supply of water is referred to, and the various sources within reasonable distance of the city have been each studied.

The area embraced within the city limits is about 8,700 acres. Upwards of 5,000 acres of this surface lie east of the New Jersey Railroad, a considerable part being marsh ground, and at present unoccupied. The area less than fifty feet above tide is 6,687 acres; between fifty and seventy-five feet, 210 acres; between seventy-five and one hundred feet, 438 acres; between one hundred and one hundred and fifty feet, 953 acres; and above the level of one hundred and fifty feet, 390 acres; the highest street grade being two hundred and fifteen, and the highest ground two hundred and twenty feet above tide.

Of the whole population, about four-fifths now occupy that portion of the city less than seventy-five feet above tide. Above that level there is probably a population of 15,000, which is rapidly increasing. Being entirely above the level of the present water-works, the whole of that part of the city is dependent on wells and cisterns, and is without any adequate provision for extinguishing fires.

#### QUANTITY OF WATER REQUIRED.

For determining the quantity of water required for the city, an inquiry into the practice and experience of other cities is necessary; and, inasmuch as many of the water-works of the country have had their capacity taxed to the utmost within a few years of their construction, it should be the aim in this case to guard, as far as possible, against the danger of a failure of the supply.

In the first water-works constructed in this country, 30 gallons to each individual of the population was considered an ample provision. The correctness of this estimate seemed to be established by the practice of some of the European cities; in fact, it may be said that few works were furnishing so liberal a supply. For several years after the construction of the works for supplying Philadelphia, the consumption did not exceed 27 to 30 gallons to each individual. The supply to the city of London in 1833 was less than 30 gallons to each inhabitant. Since that time the increased facilities for supplying water have induced a greater consumption, and in 1856 it had increased to between 40 and 50 gallons. The recent reports of the Philadelphia works also show an increased consumption.

In the construction of the Croton works for supplying the city of New York, it was considered that a supply of 35,000,000 gallons per day through the aqueduct was adequate for all the wants of a population of over one million, and that the present generation would be unable to exhaust it. In the year 1852, ten years after the introduction of water, the Croton Board made the following announcement:

"During the summer months for two years past, the whole flow of the Croton River has been turned into the aqueduct, and in 1851, for many consecutive weeks not a drop of water passed over the dam, and the lake formed by it was drawn down two feet seven and a half inches. The daily delivery in the city, for a large portion of these two years, has been about 30,000,000 gallons daily; often, in the last year, at least 5,000,000 gallons drawn from the reservoirs on the island, giving to each inhabitant in the water district (not more than 400,000) a daily supply of nearly ninety gallons."

In planning the works for the supply of Boston, 30 gallons was considered abundant, and estimating the increase of the population, it was confidently believed by the projectors of that work, that, at the end of ten years, with a population of 175,000, a supply of 5¼ million gallons per day would be sufficient, and that the quantity required in twenty years would scarcely reach 7½ millions. But within ten years of the completion of the works, (that is to say in 1858,) the report of the Cochituate Water Board shows the average daily consumption to have been upwards of 12¾ million gallons, being an average supply of 73 gallons per day to each inhabitant. Since 1851, there has been a continued increase in the consumption, from 50 gallons in that year, to 73 gallons in 1858.*

The conduit supplying the city of Boston is 6 feet 4 inches high and 5 feet wide. It was calculated to, and does furnish 7,000,000 gallons per day, with a depth of water of 3 feet 10 inches. Such an amount was thought sufficient for twenty years. In order to furnish the supply for 1859, which was 13,175,000 gallons per day, the conduit was running full for 145 days, and with a head varying from four inches to one foot eight inches for 115 days.

In Jersey City the consumption for the past two or three years has been at the rate of 60 gallons for each individual, and is fully equal to the present capacity of the works.

Other cases of the same nature might be adduced. Sufficient has been said, however, to show that under the present system of water supply, 30 gallons per head is entirely insufficient, and that from 60 to 70 gallons is nearer the quantity.

Without stopping to inquire now into the necessity of such a consumption, so much greater than was formerly deemed requisite, it is sufficient to observe that all efforts of the managers of water-works to reduce the consumption have had but little effect; and seeing the tendency everywhere to an increase in the consumption, just in proportion to the increased facilities for using the water, it has become apparent to those who have given the subject a good deal of attention, that the system of actual measurement of all water furnished must eventually be resorted to.

It is not probable that, with an abundant supply of water for Newark, the consumption would be much less than in other Northern cities. Newark is a city that depends in a great measure on manufacturing interests for its prosperity, and a plentiful supply of water is necessary for the successful prosecution of many branches of manufactures. One great source of consumption, however, is wanting there, which very much increases the quantity in those cities just mentioned, viz.: the supply of shipping and steamboats. It is considered sufficient to allow 60 gallons for each individual of that city.

According to the census of 1860, Newark contained a population of 72,055, which would require a daily supply of 4,323,300 gallons.

In order to estimate the quantity required by the future increase of the city, the following statement of population at different periods is given:

| Year. | Population. | Decennial Increase. | Per cent. Increase. |
|---|---|---|---|
| 1826 | 8,017 | | |
| 1830 | 10,995 | | |
| 1840 | 17,202 | 6,207 | 57 |
| 1850 | 38,894 | 21,692 | 126 |
| 1860 | 72,055 | 33,161 | 86 |

showing an average decennial increase, since 1830, of nearly 90 per cent.

Causes may have operated during the past 30 years, affecting the growth of Newark, which may now cease, and there may be no reason for anticipating a more rapid increase than in the case of the other cities given. It will doubtless be a safe estimate to provide for an increase of 50 per cent. every ten years.

At this rate the population and consumption of the city will be as below.

In 1865 a population of 86,000, requiring 5,160,000 gallons per day.
" 1870 " " 108,000, " 6,480,000 " "
" 1880 " " 162,000, " 9,720,000 " "
" 1890 " " 243,000, " 14,580,000 " "

Any source adequate for the supply of the city for 30 years, must, therefore, be capable of furnishing at least 15,000,000 gallons per day.

It is desirable to obtain such supply by gravitation, if an available source can be found, at sufficient height to deliver the water, entirely or in part, at an elevation of two hundred and twenty feet above tide, without involving too great an expense.

*The consumption in Boston for the year 1860 was at the rate of 97 gallons for each individual.

#### INCREASE OF SUPPLY FROM THE PRESENT SOURCE.

As Newark is now receiving a partial supply from springs within its limits, it is proper to consider whether an adequate increase can be obtained in that direction. The quantity at present derived from this source does not exceed one million gallons per day. This is obtained from numerous wells, sunk, in some cases, in a stratum of sand, and in others penetrating the sand-stone rock. The sinking of additional wells, and the deepening of some of those now in use, might result in securing some slight increase in the *present* supply, but not to the extent required for the *permanent* supply of the city. The springs are all more or less affected by summer droughts, and some fail entirely.

#### DESCRIPTION OF VARIOUS SOURCES OF SUPPLY.

To the west of Newark, among the Orange Mountains, there is no stream of sufficient size to furnish the necessary amount, and there appears to be no favorable opportunity for collecting enough in storage reservoirs. The streams of that locality flow into the Second and Third Rivers, the waters of which are already appropriated to the uses of mannfactures.

Between the two ridges, known as First and Second Mountains, a small stream has its rise and flows southward through the town of Millburn, and finally into the Rahway river. At the crossing of the Morris and Essex railroad, the stream has an elevation of about one hundred and thirty-eight feet above tide, and a short distance north an additional height of twenty-five feet. This stream, besides not being at sufficient height to supply the whole city, is entirely inadequate for the supply of the quantity required. There are several mills using the water, but the flow is so small that most of them are obliged to use steam-power during the summer months, and others suspend work entirely. It is not possible to obtain sufficient storage capacity to compensate for this deficiency during the summer months.

The area drained by the stream is about 6¼ square miles. By an examination of the tables of rain-fall, kept by William A. Whitehead, Esq., it appears that the average depth annually falling in Newark for the past seventeen years was 44.63 inches. Estimating this depth of rain-fall on a surface of 172,000,000 square feet, we have as the total annual water supply of this district 4,786,000,000 gallons. Observations have shown that not more than 50 per cent. of this is available, the balance being lost by evaporation, filtration, and absorption. This would give for the available water supply 2,393,000,000 gallons, or a daily supply of 6,556,000 gallons. This would require the construction of a large storage reservoir, and would be inadequate to the supply of the city for many years.

To the north of the city are numerous lakes and streams, having their origin in the highlands of Morris and Passaic counties, and for the most part tributary to the Passaic River. Some of these have been suggested as proper sources of supply.

Lake Hopatcong, on the borders of Morris and Sussex counties, and distant upwards of thirty miles from Newark, is at an elevation of nine hundred and twenty-one feet above tide-water. This is one of the largest lakes in the State, covering several thousand acres. Its waters are already appropriated, forming one of the principal sources of supply of the Morris canal.

Green Pond, situated about 5 miles northeast of Lake Hopatcong and about the same distance from Newark as the latter, has an elevation of nearly nine hundred feet above tide-level. It is a large body of clear, pure water, but, receiving the drainage of a comparatively small area, the flow from it during the summer months is quite small. Its outlet is through Green Pond brook and the Rockaway river. The water of this lake is also the property of the Morris Canal.

Long Pond or Greenwood lake lies partly in Passaic county and partly in the State of New York. It is at least 35 miles from Newark, and six hundred and thirty-four feet above tide, having its outlet through the Long Pond, Ringwood and Pompton Rivers, from the latter of which the water is conducted to the Morris Canal at Mead's Basin.

The Rockaway River, after receiving the waters of Green Pond, and some small streams in the neighborhood, pursues an easterly course, for a considerable

distance nearly parallel with the canal. At Boonton it takes a southeasterly course, and, with a rapid descent for most of the distance, enters the Passaic River. The distance from Newark to Boonton is about twenty miles, the water at that point being about four hundred and eighty feet above tide. Along the course of the stream are numerous flourishing mill sites, dependent on the water for power.

Without entering into any minute examination of the practicability of obtaining water from these sources, it is sufficient to observe, generally, what must be evident, that they are at such distances from the city as to render the construction of works for conveying water from them exceedingly expensive, involving an outlay of several million dollars. The country through which such works must pass is very rough, and presents many difficulties in the way of their construction.

Besides which, all the water is now devoted to other uses, and the right to take it could be obtained only by the expenditure of large sums in the construction of extensive reservoirs, as well as for compensating the present owners, or the actual purchase of their rights.

### SOURCES REQUIRING THE WATER TO BE PUMPED.

The only sources appearing to afford the necessary quantity, are,

Second and Third Rivers, separately or combined.
The Morris Canal.
The Passaic River.

The distance to Second River, from the proposed reservoir in the city, is but little more than three miles, (15,940 feet,) measured to a point above Kennedy's paper mill, at which point the water has an elevation of 90 feet above tide. Measurements of the flow of the stream were made in September last, when the discharge was at the minimum. The flow, at that time, was found, by repeated measurements, to be 5,000,000 gallons in 24 hours.

Third River was gauged at the same time, at the head race of Oakes' Mill, and gave a discharge of 6,750,000 gallons in 24 hours. The distance to this stream, from the proposed reservoir, is about four miles, (22,000 feet,) and the water at an elevation of 90 feet above tide.

Neither of these streams furnish sufficient water for a permanent supply, and the two united, would give as the minimum quantity, from eleven to twelve million gallons per day.

Second River is an exceedingly turbid stream, and for several days after every rain-fall, presents a very muddy appearance. The quality of the water in Third River is much better. Both, at times, receive a considerable waste from the canal. To obtain a supply from either, the water must be taken above the mills. The purchase of the right of the different mill owners on these streams, or substitution of steam-power, would involve such an outlay as to render the plan an exceedingly expensive one.

Before proceeding to the examination of the two remaining sources of supply, it will be proper to determine the height to which it is necessary to raise the water, or, if the whole is not obtained by pumping, to fix the head required for an efficient supply.

As has been before stated, a considerable part of the city has an elevation less than seventy feet above tide, whilst to furnish water for the upper portion, will require it to be elevated to the height of two hundred and twenty feet.

A head of two hundred and twenty feet is altogether unnecessary for the lower part of the city. Such a head, besides being too great for all the house-plumbing now done, as well as for the street mains, would produce an excessive waste, require the work to be very expensive and heavy, and involve a large unnecessary expense of pumping.

It is proposed, therefore, to divide the city into two levels, for a high and low service distribution; the water for the low service being supplied from a reservoir having its surface one hundred and six feet above tide, and the high service from a reservoir at an elevation of two hundred and twenty feet.

The reason for fixing the height of the low service reservoir at one hundred and six feet above tide, is, that it may be filled from the upper Newark level of the canal, if it is decided to take water from that source, and because also, the extensive tract of ground now owned by the Board immediately adjoining the canal, admits of the construction of a large reservoir at a comparatively light expense. This height is deemed sufficient for the efficient supply of all the lower part of the city. If the supply is taken from the river, a few feet additional elevation can be obtained in the same locality.

### MORRIS CANAL.

The Morris Canal, as has been seen, is fed by the mountain streams and lakes, forming the extensive water region of the northern part of the State. Those waters which were found to be at too great a distance from the city, to encourage the idea of taking a supply direct from them, are conducted by means of the canal, along a circuitous route, fifty miles from the summit level at Lake Hopatcong, through the city of Newark, and finally discharged into the Passaic River, their natural outlet. From the summit level the canal descends by locks and planes, crossing the Passaic River at Little Falls at a height of one hundred and seventy feet above tide. This level continues seventeen miles to the head of the Bloomfield Plane, 23,000 feet distant from the proposed low service reservoir. The surface of the canal then falls to one hundred and six feet above tide, at which height it continues through the upper part of Newark. The water, pure at its source, is thus conducted along this highway of trade, receiving in its progress only such impurities as come from the traffic of the canal.

The analysis of the canal water made previous to the construction of the Jersey City Water-Works, by Dr. James R. Chilton, shows that it contains 2.04 grains of saline and other matter to the gallon—a remarkably pure water, and excelled by few waters in the country. The disturbance of the water by the passage of boats, and the regular operations of the canal may have the effect to discolor it. During heavy rains, and for some time after, it is considerably discolored, but it is entirely owing to the presence of earthy matter held in mechanical suspension, which, when allowed to stand undisturbed for a short time, deposits on the bottom, and leaves the water clear.

The canal company estimate, that, within five years, an expenditure of three hundred thousand dollars will be required to put the canal in a condition to furnish the necessary amount. This expense, it is proposed the city of Newark shall pay to the canal company as it may be needed; "and in addition thereto, pay an annual rent for the water required, on the basis of a charge of twelve thousand dollars per annum for the first two millions of gallons daily, and a charge of one cent for every thousand gallons beyond the said two millions of gallons daily;" the water to be delivered into two reservoirs situated one hundred and six and two hundred and twenty feet above tide; the amount delivered into the upper reservoir not to exceed one-fifth of the whole supply; the necessary pipe leading to that reservoir to be furnished by the city of Newark.

In case the water is taken from the Bloomfield level at the head of the plane, the charge to be one hundred thousand dollars less, and the annual rent to be the same as above stated.

### EXAMINATION OF CANAL PLAN.

The water may be taken from either of the two levels of the canal, in one case one hundred and six feet and in the other one hundred and seventy feet above tide. If taken at the lower level the water may be delivered directly into the low service reservoir; if from the upper, it will be necessary to lay down about twenty-five thousand feet of pipe of large size.

It becomes necessary to consider whether the advantage to be derived from the increased head of the Bloomfield level will render it desirable to extend the works to that point. This level is still fifty feet below points in the city requiring water, so that even if water were taken at that point some portion of it will require to be raised higher.

It is proposed to provide for the construction of works of sufficient capacity to deliver twelve million gallons per day. To deliver this quantity through a pipe forty inches in diameter, twenty-five thousand feet long, will require a head of twenty-three feet, so that the available head in the city, or the height of a reservoir into which the pipe would discharge, would be one hundred and forty-seven feet above tide, or forty-one feet above the upper Newark level, and seventy-three feet below the level required for the high service.

The advantages gained, therefore, are an increase of forty-one feet head for the lower service, and for the upper service, a reduction in the amount of pumping required, amounting probably, to one-half the quantity, raised two-thirds the height. The saving effected would amount to about two thousand dollars per year, when the total consumption reaches twelve million gallons per day. The increased cost of this plan will be—

| | |
|---|---|
| 25,000 feet of 40-inch pipe @ $10 | $250,000 |
| From which, deduct difference charged by Canal Co. | 100,000 |
| Increased cost of works from Bloomfield Plane | $150,000 |

Some reasons have already been given why the lesser head is sufficient for the lower part of the city, and the saving in the cost of pumping for the high service will be much less than the interest on the increased cost of the works.

Unless the upper canal level offers facilities for obtaining purer water, which is possible, the supply may as well be taken from the lower level.

The construction of such a reservoir as has been suggested is necessary, in order to provide a large supply to be used in case of accident to the canal, and to allow the periodical drawing off of the water from the canal which may be necessary. It is also required to serve as a settling reservoir, in which the water may be allowed to stand for some time, before being drawn into the distributing pipes. For this purpose the reservoir should be built with at least two divisions, the water being allowed to stand and settle in one, while it is being drawn from the other.

In this connection the subject of filtering has received some attention, with a view to determine whether some plan may not be adopted in this case.

### PASSAIC RIVER.

As there can be no doubt of the capacity of this river to furnish a supply for many such cities as Newark, no measurement of the flow has been deemed necessary. The river at Belleville has a width of nearly three hundred feet, and a depth of from eight to ten feet, at low water, and discharges daily several hundred million gallons. The quality of the water is shown by analysis to be equal to that of most rivers, and excelling many in good repute.

For determining the proper place on the river from which to take water, several points have been examined. It is desirable to take the water as near the city as possible, and at the same time ensure a supply of pure water. A knowledge of the river for several years, and the opinions of those who have always lived on its banks, and long been familiar with its water, show that there is no point below the mouth of Second River, where such a supply can be depended on with certainty. At the outlet of Second River, there is a bar or reef, below which, at extreme high tides, occurring at the time of a low stage of water in the river, the water of the bay is set back, and gives the whole a brackish taste. The water of Second River also, which is much discolored by rains and manufacturing operations, imparts a color to the whole for some distance.

Above this, the most favorable point that offers is entirely above the village of Belleville, and about half a mile above the Belleville bridge. At this point, the channel is close to the western shore, giving a depth of eight or ten feet at low water. An opportunity offers for forming, on the low ground extending along the river, for nearly half a mile, a large settling and filtering reservoir. The quality of water to be obtained, and the facilities offered, are sufficient to establish this as the proper point.

There is no ground near the river, nor indeed in that vicinity, sufficiently elevated to form a reservoir at a proper height to supply the whole city, so that the alternative is presented of pumping the water direct to the low service reservoir, or into a receiving reservoir, at such elevation as can be conveniently obtained, from which it would flow to the low service reservoir.

### DESCRIPTION OF WORKS FROM PASSAIC RIVER.

#### FILTERING AND SETTLING RESERVOIR.

It is proposed to sink the excavation into the stratum of sand and gravel which abound in this locality, to

the depth of about six feet below ordinary low water in the river, retaining a strong embankment between the reservoir and the river. The banks to be raised a sufficient height to be above the level of the highest tides. The inside of the bank to have a slope of two to one, and to be covered with a slope wall of stone laid in cement, extending from about the level of low water in the river to the top of the bank. All the material down to the bed of clay, which overlies the sand and gravel, may be removed without much trouble from water; below this, it may be taken out by dredging. A bank wall of stone to extend along the river side, rising to the top of the bank; the outside of the banks to be sodded. The water, percolating through the river bank, and the bottom of the reservoir, will enter it perfectly filtered. If necessary, the water may be made to filter through the other banks of the reservoir, or it may be divided into two or more compartments.

CONDUIT.

For lines one and three it is proposed to build a brick conduit, 7,028 feet in length, delivering the water into the pump well.

ENGINE-HOUSE AND PUMPS.

It is proposed to erect two pumping engines, each of sufficient capacity to raise 6,000,000 gallons in 24 hours. The engine-house to be of sufficient size to contain four engines of this capacity. Provision is made for the construction of a suitable dock on the river, for landing coal.

The policy of laying down two lines of pumping main, as a measure of safety, has been considered. It has been shown that the increased resistance of the smaller pipes renders necessary a greater expenditure of power. If, to obtain the same or a greater capacity than that of a 36-inch pipe, two smaller pipes are laid, the expense would be very much increased. For security against accident, it is not necessary, as, with the large reservoir proposed, a supply for several days, or even weeks, can always be ensured, and with pipes of proper strength and well laid, the danger of serious accident is extremely remote.

PUMPING BY WATER POWER.

It has been suggested that by ascending the river as far as Acquackanonck, water power could be obtained from the works now constructing at that point. The dam now building, is upwards of six miles above the point where it has been proposed to take the water if pumped by steam. The works, on account of their greater length, must be proportionately increased in magnitude, in order to furnish the quantity of water estimated. The cost of such works, and the capital, the interest of which would pay the running expenses, and the annual rent for the use of power, would not be less than $750,000. This is in addition to the cost of works for pumping by steam. The interest on this amount is to be set against the cost of pumping by steam. Taking $30,000 per year as the cost of pumping 12,000,000 gallons per day, the difference in the annual expense would be $15,000.

For quantities less than this the difference in favor of pumping by steam would be still greater, for, whilst the cost of pumping would diminish, the interest on the increased capital would remain the same. For larger quantities there would still be a difference in favor of steam pumping, for both works requiring, by that time, to be extended, the ratio of cost would remain the same.

Besides this, the lease of the water at the dam must be held in common with other tenants, and there would be danger that in times of scarcity, disputes would constantly arise, as to the quantity each would be entitled to, and in case of a failure to secure the required amount of power, as the demands of the city increased, it would be necessary to resort to steam power.

PUMPING ENGINES.

The experience of years in the use of pumping engines in England, resulted in the application of the Cornish engine for this purpose. It was first applied at the mines in Cornwall, where great pains have been taken for the perfection of the machine, and by careful attention to the details of construction, and guarding against every source of waste, it has produced better results than any other engine.

Several examples of this form of engine exist in this country, among them are that of the Jersey City Water-Works, one at the Spring Garden Water-Works, Philadelphia, and two at the Cleveland Water-Works. These are economical working engines; indeed, the reputation of this form seems so well established among engineers, that, with many, it stands unquestioned as the perfection of pumping machinery.

Of late years, other forms of engines have been applied in this country, the most successful of which are those at Hartford, and a modification of the same principle at Brooklyn, and that known as the "Worthington Engine," examples of which are in operation at Cambridge and Savannah, and an improvement on the same known as the Duplex engine, the largest in use being at Harrisburg, Penn.

The Cornish engine is single acting, the power of the steam being applied to raise a pump rod or plunger, loaded with sufficient weight to move the column of water. This weight acts by its gravity when the steam pressure is removed in the cylinder, to propel the water. It is, from the nature of the work, heavy in its construction, a slow-working engine, and requires extremely careful management.

The peculiarity of the Hartford arrangement consists in the pumps, of which there are four. Each pump has two buckets, worked by cams operating on bell-cranks connected with the pump-rods. The cams are so shaped as to move the two buckets in the same pump barrel in opposite directions, one having the lead of the other; that is to say, when the upper bucket is moving downwards the lower one is traveling upwards, passing the water raised by it through the upper bucket. The upward motion of the lower bucket continues until the upper has reversed and commences motion in the same direction, when it reverses; the same happens on the next stroke. Each pump, therefore, takes up the load before it has been released by the other. The design of this arrangement is to give a continuous flow to the water.

The Brooklyn engine is a double-acting beam engine, of large dimensions. It has a pump attached to each end of the beam, the piston rod being extended through the bottom of the steam cylinder, forming the connection for the lower pump. The lower pump delivers through the upper, giving very nearly a constant flow to the water. The principle of the loaded plunger is here used to a certain extent, to assist in working steam expansively.

The engines in use at Savannah and Cambridge are direct acting horizontal engines, using steam expansively; for this purpose two cylinders are employed. The arrangement known as the Duplex engine consists of a pair of such engines coupled together, and, by a very simple combination, the motion of one is made to work the valves of the other. The motions of the two are so arranged with regard to each other, that they do not reverse at the same time. Thus, at the end of each stroke of either engine, the other will be in full motion, and the interval of time which passes between the completion of the stroke and the opening of the valve, allows the water valves to close quietly, and avoids the slamming and concussion incident to all rapid reciprocating motions. At each end of the stroke the engines rest with the deliberation of the Cornish movement, without the immense mass of matter in motion. The motion is communicated directly from the steam to the water cylinder without the use of beam or other equivalent arrangement. The whole is very compact, delivering the water with great regularity.

For the purpose of comparing these various forms of engine, the Brooklyn Water Commissioners caused a series of experiments to be made, the result of which is contained in the following table, the engines being ranked according to the duties performed.

It is obtained from a report to the Brooklyn Commissioners made by J. P. KIRKWOOD, Esq., engineer, giving the results as reported by the Board of Mechanical Engineers appointed to conduct the experiments.

TABLE,

*Showing duty performed by various pumping engines in the United States. The duty is expressed in pounds lifted one foot high by one pound of coal.*

| Date of Experiment. | Character of Engine. | Location. | Duty. |
|---|---|---|---|
| 1857 | Worthington. | Cambridge, Mass. | 672,579 |
| Jan. 1857 | Cornish. | Belleville, N. J. | 628,233 |
| " 1857 | Crank. | Hartford, Conn. | 616,404 |
| " 1860 | Double-acting Beam. | Brooklyn. | 601,407 |
| June 1856 | Cornish. | Spring Garden, Phila | 589,053 |

These are the effective duties, or actual delivery at the reservoir, the proper allowance having been made for friction of engines and pump mains, and leakage of pump valves.

These experiments were made with a good deal of care, and are doubtless reliable. In two cases at least they were repeated, for the purpose of verifying the results first obtained.

The Cornish engine, being of large dimensions and immense weight, requires foundations proportionately heavy for its support. It occupies considerable space, and requires for its operation a building having large area and height, requiring to be very strongly built. The engine-house and foundations of the Belleville engine cost about $70,000—the building being adapted for two engines.

The engine-house of the Brooklyn works is also a heavy structure, the engine requiring, as the Cornish engine, massive foundations and a large building to enclose it. The cost of that building, capable of receiving four engines of the same capacity as the present, is reported to have been about $90,000.

The construction of the Worthington engine is such as not to require very heavy foundations; being compact and working horizontally, they require little more than sufficient work to simply support their weight, and the walls and roof of a one-story building to enclose them. The fact that they are set up to run experimentally, on an ordinary engine-house floor, without even a bolt to hold them in position, shows how little external support they require.

Apart from all considerations of engine duty, it is believed that, for cheapness of foundations and buildings, simplicity of construction and ease of management, the Worthington engine, or the modification known as the Duplex engine, is preferable to all others in use; and, if the results of the Brooklyn experiments are to be relied upon, of which there can be no doubt, as good a duty can be obtained from this as from any other engine, without involving a greater expense for engines.

COMPARISON OF CANAL AND RIVER ESTIMATES.

With a supply of water from the canal, the city, being in the position of a tenant, without the power to control the sources of supply or the operations of the canal, might not feel so secure as if independent of all other authorities; and however securely there interests might be guarded, and however scrupulously exact the Canal Company might be in the performance of their obligations under the contract, some uncertainty might still attend the project. This must be so, not because of any peculiar insecurity in the position of the canal, or doubts of its ability to furnish a large amount of water, as the same would be true of any source where the obtaining of water is a matter of arrangement between parties, one of which controls the supply on which the other entirely depends.

After carefully considering the various sources, and estimating the relative cost, it is urged that it would be for the interest of the city to adopt that source from which a supply may be obtained, even at a somewhat increased cost, untrammelled by any complex arrangement liable to different construction, according to the varying interests of the parties concerned, viz., the Passaic River.

CEMENT PIPES.

Within a few years this pipe has been extensively used for distributing water. The advantages claimed for it are, cheapness, freedom from oxidation, possessing at the same time sufficient strength for any desired pressure.

Among the water-works using this kind of pipe entirely or in part, are those at Plymouth and Pittsfield, Mass., Bridgeport and New Britain, Conn., Brooklyn, Watertown, and Cohoes, N. Y., Paterson, Elizabeth, and Jersey City. It is being introduced, also, at New Haven, the Central Park, New York, and many other places in different parts of the country. It is considered by the most reliable judges to be a reliable pipe, and when manufactured of proper materials, and properly laid, strong and durable.

The largest sized cement pipes that have been laid are twenty inches in diameter, and if the larger pipes are as reliable as the smaller, which those engaged in the manufacture of the pipe claim, it may be applicable to the entire distribution of large cities. Further

examinations may be necessary to determine this. The estimate for cement pipe reduces the cost of distribution upwards of $60,000.

THE PLAN RECOMMENDED

may be thus stated: to take the water from the Passaic River, receiving it into a settling and filtering reservoir; thence conducting it through a brick conduit to the pump well, the water to be elevated by steam power and delivered directly into the low service reservoir. From thence it is to be distributed to the lower part of the city; and the quantity required for the high service, pumped to an additional height of 114 feet by means of steam-engines, and delivered into the high service reservoir—from this reservoir all that part of the city more than 70 feet above tide to be supplied. The estimates have been made for the construction of works capable of supplying 12,000,000 gallons per day, and provision made for their extension. The estimated cost is as follows:

| | |
|---|---|
| Filtering and Settling Reservoir, and work at the river. | $18,072 00 |
| Conduit | 43,468 62 |
| Engine House and Pump Well | 17,146 70 |
| Two Pumping Engines and Boilers | 60,000 00 |
| Low Service Pump Main | 134,300 00 |
| Low Service Reservoir | 56,049 47 |
| High Service Engines and House | 26,000 00 |
| High Service Pump Main | 22,800 00 |
| High Service Reservoir | 18,371 00 |
| City Distribution (cast iron pipe) | 304,679 00 |
| | $700,886 79 |
| To which is added 10 per cent. for contingencies, engineering, land damages, &c. | 70,088 68 |
| | $770,975 47 |

INCOME FROM WORKS.

For forming any estimate of the probable income, it will first be assumed that the water is distributed throughout the city, and all buildings assessed in front of which water-pipes are laid.

The number of buildings in Newark now supplied is 1966, of which 1371 are dwellings, and 565 purposes other than domestic, for which water is used. The income from the old works for the past year was, for dwellings and manufacturing purposes, $16,338 46, and for street sprinkling, $1,160 53; total, $17,498 99. The whole number of buildings occupied as dwellings in the city is 10,212, and buildings occupied and used for other purposes, 1,554; total, 11,766. In this last classification, under the head of dwellings, are included many buildings occupied partly as dwellings, and partly for stores, shops, &c.

The revenue of the present works is obtained from the water books in the office, on which many buildings are charged as using water for more than one purpose; thus a building occupied by two or more tenants engaged in different business, pays for water for two or more purposes; so that the purposes for which water is used, is considerably more than the number of buildings.

For the purpose of an estimate, it is near enough to take the proportion of the city now receiving a supply at one-sixth of the whole. If the same scale of charges is adhered to in the new works, the income would be—

| | |
|---|---|
| From dwellings and manufactories | $98,030 76 |
| Street sprinkling | 1,000 00 |
| | $99,030 76 |

An excess of $20,790 23 over the amount estimated as necessary to pay the annual expenses of the works.

Taking the consumption at five million gallons per day, the income at five cents per one thousand gallons would be $91,250.

The entire report of Mr. Bailey is very interesting, and will amply repay perusal. It contains much useful information which our limited space prevented us from mentioning. If his suggestions be adopted, the city of Newark will be in possession of a pure and abundant supply, which in a place of so much prospective importance, is no small matter.

*Members of the*

NEWARK AQUEDUCT BOARD.

WILLIAM S. FAITOUTE, EDWARD DOUGHTY,
DANIEL DODD, JACOB VAN ARSDALE,
THOMAS R. WILLIAMS, HENRY G. DARCY,
MOSES BIGELOW, Mayor, *ex-officio*.

CORN OIL.—It is said that Indian Corn produces a clean fluid, which burns without odor, without smoke, and is inexpensive, affording a good light, in an ordinary kerosene lamp, for half a cent an hour. The corn oil is clear and colorless as water.

REDUCTION IN THE PRICE OF GAS IN ENGLAND.—We continue to hear of reductions in the price of gas in Great Britain; and in some instances where no actual reduction has taken place, the question of lessening the price is being warmly discussed. The London *Builder* says:—The Plymouth Gas Company is really a model one, as regards the mutual interests of the public and the proprietary. We have frequently had occasion to report their successive reductions in price; each reduction yielding so much additional profit to the company as to necessitate, in a manner, a still further reduction. In the report of the directors for the meeting of proprietors on 19th June current, it is stated that "the directors, in submitting their usual report, on the occasion of another annual general meeting, have pleasure in drawing the attention of the proprietors to the steady and satisfactory increase in the business of the company. The gas rental exceeds that of last year by the sum of 224*l.* 8s. 5d., notwithstanding the reduction to the consumers amounts to 1,519*l.* 14s. 2d." The report afterwards goes on to say that "at the last annual general meeting the directors announced their intention to reduce the price of gas from 3s. 9d. to 3s. 4d. per 1,000 cubic feet; and it is gratifying to them to state that the increase in the consumption which has taken place since that period has so fully realized their anticipations, that they are now enabled to announce their intention to make a further reduction of 4d. per 1,000 feet from and after the 29th September next, when the charge will be 3s. per 1,000 cubic feet; thereby giving their customers the benefit of reduced charges on their next winter's consumption." The company are still reaping their maximum dividends of 10 per cent. on one half of the shares and 7½ per cent. on the other, notwithstanding all these reductions. Such a company well merits the highest dividends allowable by any local or general gas Act, namely, 10 per cent.; but we believe that *their* Act—shall we say unfortunately—restricts them to 7½ on the "new" shares.

The Hinkley Gas-Light and Coke Company have held their twenty-seventh general annual meeting. The directors, it was stated, have had under their consideration, for some time past, the price of gas consumed by meter, with a view to a reduction at the earliest possible period; and after the present quarter an abatement will be made. A dividend of 7½ per cent., free of income-tax, was declared.

At the annual general meeting of the Kelso Gas Company, a dividend of 10 per cent. on the paid up capital of the company was declared. The price of gas was reduced from 7s. 6d. to 6s. 8d. per 1,000 cubic feet.

GAS IN SCOTLAND.—The Edinburgh gas consumers are forming a new gas company, with a capital of £75,000, which it is stated will secure a better plant than has cost the Edinburgh Gas-Light Company £150,000. The company is to contract with consumers for the supply of gas for any period up to ten years, at 3s. 6d. per 1,000 cubic feet, the quality to be equal to what is at present supplied to the city.

The Fettercairn Gas Company have held their annual general meeting. At the previous meeting, says the *Melrose Review*, "it was confidently anticipated that a considerable profit would be available this year as a dividend; but, on the contrary, the treasurer's balance sheet exhibited a loss of £11 13s. 3½d.; this unsatisfactory state of affairs is mainly attributed to the enormous consumption of coal as compared with former years, as well as with the return derived from them." It is worthy of remark, that the price of gas here is amongst the highest in Scotland, being 15s. per 1,000 cubic feet; but the directors appear too obtuse, and too much bent on gain by ridiculously high prices, to be able to see that their losses arise from the highness of the price they charge; and even yet, doubtless, their stupid mode of reasoning will be that, since 15s. do not yield any profit, they must raise the price. The folly of such reasoning is shown by the condition of numerous companies who experience a more profitable business at every reasonable reduction in price.

AIR NECESSARY TO COMBUSTION.—It requires ten tons of air, including two tons of oxygen, to burn one ton of coal.

THE PRODUCTION OF STEEL.—At the last meeting of the French Academy of Sciences, M. Caron said he had caused two knife-blades, two gravers, and two files to be made of good iron at the works of the Artillery Department; that he had subjected them for a long time at a red heat to the action of a current of hydrogen, in order to deprive them of all the nitrogen they might happen to contain (ammonia being, of course, formed thereby), and at length he had substituted the purest proto-carburetted hydrogen for the simple hydrogen. At the expiration of six or seven hours, the pieces above mentioned had been found converted into steel of the first quality. M. Caron therefore contended that there was no need of nitrogen to produce steel, and that carbon was quite sufficient. To this M. Frémy replied that the nitrogen contained in the iron employed had not been completely expelled, and that, consequently, M. Caron's experiments could not overthrow his theory. It so happened that immediately afterwards M. Boussingault read a paper in which he stated that he had prepared some iron, theoretically considered pure, from chloride of iron, and to his surprise found it to contain nine ten-thousandth parts of nitrogen. He attributed this to some secret cause of error, and had, he said applied to MM. St. Claire Deville, Caron, and Frémy for some pure iron, and was preparing more himself, in order to repeat the experiment and see whether there were no means of getting rid of the nitrogen. M. Frémy immediately seized upon the opportunity to repeat his argument, and impress the Academy with the idea that nitrogen was an inevitable concomitant of iron, cast-iron, and steel. Carbon, he said, might, by a slow action, convert the surface of iron into steel; but if its action were continued, cast iron would be the ultimate result. He further cautioned his hearers against supposing that the operations of the laboratory could be compared to those effected on a large scale, where nitrogen was being constantly developed and reabsorbed—such operations lasting a fortnight or three weeks.—*Galignani.*

INDIAN AND AUSTRALIAN COALS.—Dr. Haines reports on samples of coal from Australia, the Nerbudda Valley, and Nagpore, that the Australian coal is jet black and brilliant, very brittle, and breaks with a cubical fracture, like Newcastle coal. The Nerbudda coal is dull, black, heavy, and very hard, being pulverized with difficulty; it has a laminated structure and slaty cleavage; interspersed in its substance are seen here and there small lumps of half-formed coal, like charcoal. The Nagpore coal is very similar in appearance to the Nerbudda coal, and has the same texture, except that the lamina are alternately dull and glossy. The Australian coal is bituminous, and cokes like Newcastle coal. The Nerbudda and Nagpore coals do not even unite together in coking; they would appear, therefore, to be not well suited for that operation. The ash of the Australian coal was of a dirty white color; the table shows it to be rather abundant; that or the Nerbudda and Nagpore coals is much the same in appearance, but in very large proportion, and its abundance, by clogging the fire-bars, must detract a great deal from the utility of the coal, independently of the loss of the carbonaceous matter, whose place it occupies. The sulphur, in all three specimens, is in moderate proportion. The number of pounds of water raised from 80° to 212° by 1 lb. of Australian, Nerbudda Valley, and Nagpore coal respectively, was 66.69, 53.81, 64.20; while the average for Welsh steam coal is 95.5, for Scotch 78.54, and for Newcastle 92.4. The number of pounds of water evaporated from 210° by 1 lb. of Australian coal, was 5.64; by 1 lb. of Nerbudda Valley, 4.54; and by 1 lb. of Nagpore, 5.42. The averages for Welsh, Scotch, and Newcastle coal are 6.07, 6.64, 7.81.

TRANMERE WATER-WORKS, CHESHIRE, ENGLAND.—The foundation-stone has been laid of the water-tower and reservoir for the water-works at Tranmere, in Cheshire. The site of the reservoir is the highest elevation in the township. The reservoir is 70 feet square, and when puddled and cemented round, will have 21 feet depth of water, or 640,000 gallons, about equal to four days' supply for the present population.

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THE
# AMERICAN GAS-LIGHT JOURNAL,

PUBLISHED ON 1ST AND 15TH OF EVERY MONTH.

PROPRIETOR, JOHN B. MURRAY. | EDITOR, C. ELTON BUCK.

THURSDAY, AUGUST 1, 1861.

It is proposed to establish in London, England, a weekly journal devoted to gas, water-supply, and sanitary subjects, and it is generally understood that Mr. Samuel Hughes, the well-known author of a treatise on gas-works, and a conspicuous advocate of the Sale-of-Gas-Act, and of various reforms in the gas interest, is to be the editor.

When the venerable "Paterfamilias"—yclept the London *Journal of Gas-Lighting*, published to the world in his usual complacent and self-satisfied manner his parental cogitations on the subject of his interesting family, he mentioned that a further progency was expected.*

We now behold his fond anticipations about being realized. The promised "future progeny" is beginning to kick, and will soon be ushered into this mundane sphere, to scramble and scratch for himself. There is reason to fear, however, that the old gentleman does not regard the prospect of this particular increase of his family with that unalloyed pleasure which might be looked for in so loving a sire. His announcement of the expected event has just been laid before us, and we think we can detect a suppressed utterance of wrath, and our imagination reveals to us the portentous frown which must have spread over his sometimes benignant features while penning the lines conveying such momentous tidings. In fact, the news is not proclaimed as cheerfully as such interesting events generally are, when broken for the first time to curious friends, by members of well-regulated families. It may be that "hard times" have reached the paternal domain, and, like a prudent man as he is, the old gentleman looks aghast at the prospect of those little bills which usually accompany such episodes as we have been contemplating. That limited portion of the world among whom our worthy progenitor moves, knows how greatly he loves to hear himself talk (*alias* grumble)—an isolated pleasure, withal—and with what self-satisfaction he lays down the proposition and draws the conclusion; himself being judge, witness, and jury, in all cases of diversity of opinion. This Russian mode of reconciling opinions has at length brought out the English method of correcting it, and those who have been heretofore refused an impartial hearing, have applied a remedy by selecting their own spokesman, instead of allowing our worthy parent to do all the talking.

Perchance the perturbed state of mind of the "guv-nor" may arise from the fear—too often, alas, well founded—that the youngster may exhibit such unwarrantable precocity as to step into the old gentleman's capacious shoes, and crowd him out of the family mansion, thus leaving him entirely out in the cold—a game which, on this side of the Atlantic, politicians often play. But whatever it be that disturbs the whilom equanimity of our honored sire, we tender him our deep condolence, and assure him our sincere sympathies are with him in this his hour of incertitude and dismay.

As for the expected youngster, to whom we must extend a hearty fraternal greeting, we must at the same time presume upon our accidental position of next elder brother, and in some measure assume the character of mentor, in order that we may point with the finger of wisdom at the past errors of the head of our cosmopolitan family, and draw an instructive lesson therefrom for the benefit of the boy. In teaching the young idea how to shoot, we must see to it that his weapons are well loaded and properly pointed, so that they may not recoil with disaster to himself, nor send destructive darts among his best friends, as his urbane father so frequently does, thereby causing much harm to result to himself in consequence. We regret that the distance of three thousand miles precludes all hope of our being present at the christening of the little stranger, but our thoughts will be with "Paterfamilias" on that ever-to-be-remembered occasion. We trust our respected progenitor will appreciate this difficulty, and at an early period announce to us the name by which the new member of our increasing family is to be known.

* See the AMERICAN GAS-LIGHT JOURNAL, Vol. I., p. 151.

## PROSPECTIVE INCREASE IN THE WATER-SUPPLY OF NEW YORK CITY.

The citizens of New York, who have for some time past experienced considerable inconvenience in a somewhat limited supply of Croton water, will be gratified to hear that improvements and additions are now in course of completion which will augment the supply to nearly three times the quantity at present furnished. It is supposed that by September 1st the water will be let through the new main, which has already been laid across the High Bridge. This immense main is seven feet six and a half inches in diameter. It is made of boiler-iron, in sections of six feet long, each of which weighs 7,000 pounds. Each of these sections is composed of three pieces of plate-iron, fastened together by 276 rivets, and every section is fastened to the adjoining one by 437 rivets.

Effective preparations have been made to avoid all danger from the effects of the expansion and contraction of this main. That portion already laid, about 1,300 feet in length, expanded, during some of the recent warm days, about four inches at each end—eight inches altogether. The main is to be supported upon permanent iron pedestals, about five feet high, weighing 1,400 pounds, each firmly embedded in stone. Upon the pedestals are placed iron saddles, which serve as the immediate support of the pipe. In order to successfully provide for the expansion of the main, between the saddle and pedestal, there is an iron frame, containing three iron rollers, three inches in diameter, which will move backwards and forwards over the surface of the pedestals and under the base block of the saddle, as the expansions and contractions of the pipe take place, and thus avoid accidents which might otherwise occur.

The greatest precaution is being taken to guard against disastrous consequences from expansion of the pipe at each end of the High Bridge, by the introduction of sliding joints, or sections, which will be made with the same degree of perfection, and work as smoothly as the piston in the cylinder of a first-class steam-engine.

It is said, that when the improvements now in progress are completed, the mains leading from the reservoirs will be capable of furnishing from 900,000,000 to 1,000,000,000 gallons of water daily. The capacity of the present pipes is but about 30,000,000 gallons daily.

We regard this prospective increase of water-supply as a boon of great value to the citizens of New York. In a sanitary point of view, its importance cannot be too highly estimated. The inconvenience of a limited supply has been some time felt, and the recent breakages in the Croton mains have caused a considerable amount of trouble, besides giving rise to a feeling of uneasiness as to the possible occurrence of a large fire in the event of a like contingency. When the new main shall have been put in operation, we trust no grounds of complaint will be allowed to remain, and we believe that the supply thus furnished will be adequate for any reasonable demand for some years to come.

## NOTICE TO SUBSCRIBERS IN GREAT BRITAIN.

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## TO PHILALELPHIA ADVERTISERS.

Mr. V. HAROLD MYERS, No. 156 South Fourth Street, is our sole agent for Philadelphia, and is authorized to receive subscriptions and advertisements at our regular rates, *payable in advance* in all cases.

PERSONAL.—We have lately had the pleasure of a visit from Prof. W. E. A. AIKIN, of the University of Maryland, Baltimore. As we mentioned on page 380, vol. II., Professor AIKIN has been appointed inspector of the quality and illuminating power of the gas sold by the Baltimore Gas Company, and we hope to lay his official reports before our readers. Had the Baltimore Gas Company acted with proper liberality, and introduced the photometer, and instituted regular tests of their gas for the satisfaction of their customers, there would have been no occasion to invoke municipal interference, for no ground of complaint on this score would have been heard. But the company, ignoring the just rights of consumers, chose to pursue a narrow-minded policy, thus giving rise to numerous complaints, which ended in a stringent ordinance being passed by the municipal authorities, providing for photometrical and chemical tests of the gas, and also for the inspection and sealing of meters. Other rich gas-companies, which can afford to declare large secret dividends, and who yet allow gross violations of the rights due to consumers to occur daily, would do well to notice the efficient action of the Baltimore authorities, and to profit thereby.

MILWAUKEE, WIS.—The following circular has been issued by this company as an explanation of the causes of its passing the regular semi-annual dividend, due July 1:

MILWAUKEE GAS-LIGHT COMPANY,
Milwaukee, July 3, 1861.

I am directed to inform you that, at a meeting of the Board of Directors held 1st inst., (the secretary having presented his semi-annual Financial Statement, which was accepted,) it was unanimously resolved: That in view of the present financial condition of the country, and the utter impossibility of being able to transmit the dividends to the stockholders, the usual semi-annual dividend be postponed for the present, or until such dividends can be paid in the usual manner, by draft on New York city.

E. IRONS, Secretary.

[If the reason assigned is the true one, why not declare the dividend payable in Milwaukee, as was done Jany. 1? The stockholders would rather lose the 6 per cent. exchange than the whole dividend.—ED.]

MORE NEW DYES.—According to the *Comptes Rendus* of the *Académie des Sciences*, M. Roussin has announced the discovery of a process by which brilliant red, violet, and blue colors are obtained from napthaline.

## THE PIRATE FLAG.

Jefferson Davis, the arch-traitor, who is endeavoring to subvert the United States Government, has, among other treasonable acts, issued letters of marque and reprisal, which are telling upon our commerce to a serious extent.

A clever artist has sent us a well-executed "take off" of "J. D., his marque," which we present for the benefit of those distant readers who are unacquainted with the wrong-headed traitor who cannot *right* anything.

## ANSWERS TO CORRESPONDENTS.

A. J. D., of Conn.—*The average rate per* 1,000 *gallons, for which consumers pay for water in New York city, is* .0685 *cents. In Philadelphia it is* .0769 *cents. This is the average amount paid by each water-taker. The introduction of water-meters would put the burden upon the large consumers where it belongs, and would be a matter of justice to those who neither waste water nor use an excessive amount.*

E. J. M., of N. Y.—*You place your estimate too high. The most competent engineers think that* 700,000 *feet is as near the mark as can be reached by the average quality. Some individual instances may have exceeded this, but it is the average.*

O. B. S., of N. J.—*We have heard them very highly recommended by those who have used them and compared them with the retorts of other makers.*

H. J. W., of Pa.—*Your communication was not received in time. We will attend to it for you, and advise you of the plausibility of your suggestion, when we have time to examine it.*

M. T. M., of Ohio.—*Anthracite coal contains more carbon and less hydrogen and oxygen than bituminous or cannel coals. It also contains a much less proportion of ash. Lignite or brown coal contains less carbon than ony other variety—about* 71 *per cent., while anthracite has* 91 *per cent.*

A. H., of Ind.—*Judging from letters we have received, we should deem it to be a good locality for the purpose. The ore is good, and large coal fields and lime stone quarries are in the immediate vicinity. Still, other circumstances may do away with these advantages. The ore should be analyzed, for a mere glance can reveal nothing of its worth for practical purposes.*

P. K. G., of Ky.—*We have answered the same question through our correspondent's column. Although the cannel coals found in your State are the best oil producing coals known, yet we belive they will have to succumb to the superior cheapness, and many other advantages offered by the use of petroleum. Still, the coal beds possess much value, and are very useful for other purposes.*

L. D. E., of Mich.—*We have seen a sample of the pipe, although we have not witnessed a practical test of its air-tight qualities. We believe it to be well adapted for your purpose.*

F. K., of Wis.—*We think not. Two layers of bricks, laid on their sides, in Roman cement, are much better than one layer set on edge, and consume but little more material. Before commencing, however, you should be particular and ascertain the character of the soil.*

W. & K., of Cal.—*We are glad to hear of the success of your enterprise. The prices you charge would startle consumers in this region, and you would be daily regaled with choice bits of complaint, and many threats of legislative interference.*

T. E. L., of Oregon.—*Experienced engineers are not unanimous in commending the retort. We hardly know how to advise in the matter, as we think it unfair to express an opinion without being sustained by practical data. As the matter now stands, we would advise you to let it alone until you come East, when you can soon satisfy yourself of the points in controversy.*

J. S. P., of Pa.—*The capacity of the reservoir of the Chicago Water-Works is* 1,500,000 *gallons. The water is pumped by steam-power, and distributed to the citizens through* 85 *miles of pipe.*

## COMMONWEALTH OF MASSACHUSETTS.

### AN ACT

FOR THE INSPECTION OF GAS METERS, THE PROTECTION OF GAS CONSUMERS, AND THE PROTECTION AND REGULATION OF GAS-LIGHT COMPANIES.

*Be it enacted by the Senate and House of Representatives, in General Court assembled, and by the authority of the same, as follows:*

SECT. 1.—The governor shall, with the advice and consent of the council, appoint an inspector of Gas Meters and of Illuminating Gas, whose office shall be in the city of Boston, and whose duty it shall be when required, as hereinafter provided, to inspect, examine, prove, and ascertain the accuracy of any and all gas meters to be used for measuring the quantity of illuminating gas to be furnished to or for the use of any person or persons, and when found to be correct, to seal, stamp, or mark all such meters, and each of them, with some suitable device, and with his name, the date of his inspection, and the number of burners it is calculated to supply. Such device shall be recorded in the office of the secretary of the Commonwealth.

SECT. 2.—He shall hold his office for the term of three years from the time of his appointment, and until the appointment of his successor, but may be removed by the governor and council at their pleasure, and he shall receive an annual salary of three thousand dollars, which shall include his office-rent and expenses, to be paid out of the treasury on the warrant of his excellency the governor. Such inspector shall not in any way or manner, directly or indirectly, be interested pecuniarly in the manufacture or sale of illuminating gas or gas-meters, or of any article or commodity used by gas-light companies, or for any purpose connected with the consumption of gas, or with any gas company; and shall not give certificates or written opinions to any maker or vender of any meter, or of any such article or commodity; and he shall be duly sworn to the faithful performance of his duties, and shall give bonds in the sum of five thousand dollars for the faithful discharge of the same; *provided, however*, that no warrant shall be drawn for the whole or any part of the salary of said commissioner for any larger amount than may have been actually paid into the treasury of the Commonwealth.

SECT. 3.—Said inspector shall, within three months after his appointment, furnish to the treasurer and receiver-general a list of all the gas-light companies in operation in the Commonwealth; and his salary for the year then commenced, and annually thereafter, shall be assessed and paid into the treasury of the Commonwealth by the several gas-light companies in this Commonwealth, in amounts proportionate to their appraised valuation, as declared in the returns required in the General Statutes of this Commonwealth, chapter sixty-eight, section twenty; and in case such gas-light companies, or any or either of them, shall refuse or neglect to pay into the treasury the amount or portion of said salary which shall be by said treasurer required of them respectively, for the space of thirty days after written notice given by said treasurer to them respectively, to make such payment, then the said treasurer shall institute an action in the name of, and for the use of, the Commonwealth, against any such delinquent gas-light company for their said portion or amount of such salary, with interest thereon at the rate of ten per centum per annum, from the time when said notice to make such payment was given, and the costs of the action.

SECT. 4.—Whenever the inspector shall find himself unable to attend to his duties in any city or town of said county, he shall appoint temporarily, and for such time as he may deem expedient, one or more deputy-inspectors of meters for such county, who shall act under his direction; they shall be duly sworn to the faithful performance of their duties, and shall not in any manner be connected with or employed by any gas company, and shall be subject to the same disabilities as are set forth in section second, and shall be paid by fees for examining, comparing, and testing gas-meters, with or without stamping them, which fees shall be twenty-five cents for each meter delivering a cubic foot of gas in four or more revolutions, vibrations, or complete repetitions of its action, and thirty cents for each meter delivering a cubic foot of gas in any less number of revolutions as heretofore described, and for each meter thus delivering more than one cubic foot of gas as before named, the further sum of twenty cents for every additional cubic foot of gas delivered: *provided, however*, that in all cases of inspection by the deputy-inspector the gas company or consumer may appeal to the state inspector from the deputy-inspector's decision.

SECT. 5.—The standard or unit of measure for the sale of illuminating gas by meter shall be the cubic foot, containing sixty-two and three hundred twenty-one one-thousandth pounds avoirdupois weight of distilled or rain-water, weighed in air of the temperature of sixty-two degrees Fahrenheit scale, the barometer being at thirty inches.

SECT. 6.—No meter shall be set after the first day of October, eighteen hundred and sixty-one, unless it be sealed and stamped in the manner required by this act.

SECT. 7.—There shall be provided at the expense of the gas companies of the Commonwealth, at the office of the inspector, a standard measure of the cubic foot, and such other apparatus as in his judgment shall be necessary for the faithful performance of the duties of his office.

SECT. 8.—Every gas-light company with a capital paid in of one hundred thousand dollars, or more, and every maker and vendor of meters, shall set up at some convenient place upon their premises a gas-holder, to be tested, and if correct stamped and sealed, containing five or more cubic feet, by means of which meters shall be tested at the average pressure at which gas is supplied in the city or town where they are to be used; attention being paid to the temperature of the room where the trial is made, of the apparatus, and of the gas. There shall be provided by every gas-light company, a test-meter of a construction approved by the inspector and stamped by him, to be used in cities and towns where no test gas-holders are provided, or whenever proving by a gas-holder is impracticable or inconvenient. In the examination of a meter the inspector shall see that it is of an approved principle, and shall give his particular attention to the measure of the dial-plate; he shall prove the meter when set level, and for each burner which the manufacturer has stamped it to register, it shall be capable of passing gas accurately at the rate of six cubic feet per hour; and no dry meter shall be stamped correct which varies more than two per cent. from the standard measure of the cubic foot, and no wet meter shall be stamped correct, which is capable of registering more than two per cent. against the consumer, and five per cent. against the company. He shall keep at his office a correct record of all meters inspected by him, with their proof at the time of inspection, which record shall be open at all times for examination by the officers of any gas-light company in this Commonwealth.

SECT. 9.—Meters in use shall be tested on the request of the consumer, or the gas-light company, in the presence of the consumer if desired, with sealed apparatus, as provided for in section eight, by the inspector or deputy-inspector. If the meter is found to be correct, the party requesting the inspection shall pay the fees named in section four, and the expense of removing the same for the purpose of being tested, and the re-inspection shall be stamped on the meter. If proved incorrect, the gas-light company shall pay such expenses, and shall furnish a new meter without any charge to the consumer.

SECT. 10.—Illuminating gas shall not be merchantable in this Commonwealth which has a minimum value of less than twelve candles; that is, a burner consuming five cubic feet per hour shall give a light as measured by the photometric apparatus in ordinary use, of not less than twelve standard sperm candles, each consuming one hundred and twenty grains per hour. Every gas is to be tested with the burner and under the pressure best adapted to it, and the result shall be calculated at a temperature of sixty degrees Fahrenheit. Whenever requested by the mayor and aldermen of any city, or the selectmen of any town, the inspector shall report to them whether the gas supplied in the respective city or town is of the legal standard, and also whether it is sufficiently well purified from sulphuretted hydrogen, ammonia, and carbonic acid.

SECT. 11.—Any officer or servant of a gas-light company, duly authorized in writing by the president, treasurer, agent, or secretary of said company, may, at any reasonable time, enter any premises lighted with gas supplied by such company, for the purpose of examining, or removing the meters, pipes, fittings, and works for supplying or regulating the supply of gas, and of ascertaining the quantity of gas consumed or supplied; and if any person shall at any time, directly or indirectly, prevent or hinder any such officer or servant from so entering any such premises, or from making such examination, or removal, such officer or servant may make complaint under oath to any justice of the peace of the county wherein such premises are situated, stating the facts in the case so far as he has knowledge thereof, and the said justice may thereupon issue a warrant directed to the sheriff or either of his deputies, or to any constable of the city or town where such company is located, commanding him to take sufficient aid and repair to said premises, accompanied by such officer or servant, who shall examine such meters, pipes, fittings, and works for supplying or regulating the supply of gas, and of ascertaining the quantity of gas consumed or supplied therein, and if required, remove any meters, pipes, fittings, and works belonging to said company.

SECT. 12.—If any person or persons supplied with gas neglects or refuses to pay the amount due for the same, or for the rent of the meter or other articles hired by him or them of the company, such company may stop the gas from entering the premises of such person or persons. In such cases the officers, servants, or workmen of the gas-light company, may, after twenty-four hours' notice, enter the premises of such parties, between the hours of eight in the forenoon and four in the afternoon, and separate and take away such meter, or other property of the company, and may disconnect any meter, pipes, fittings, or other works, whether the property of the company or not, from the mains or pipe of the company.

SECT. 13.—Every person who wilfully or fraudulently injures, or suffers to be injured, any meter, pipes, or fittings belonging to any such gas-light company, or prevents any meter from duly registering the quantity of gas supplied through the same, or in any way hinders or interferes with its proper action or just registration, or fraudulently burns the gas of said company, or wastes the same, shall for every such offence, forfeit and pay to the company not more than one hundred dollars, to be recovered in an action of tort to be brought by the company against such offender, and in addition thereto, shall pay the company the amount of damage by them sustained by reason of such injury, prevention, waste, consumption, or hindrance.

SECT. 14.—Every person who attaches any pipe to any main or pipe belonging to any such gas-light company, or otherwise burns, or uses, or causes to be used, any gas supplied by said company, without their written consent, unless the same passes through a meter set by the company, shall forfeit and pay to said company the same fine and in the same manner as declared in section thirteen.

SECT. 15.—This act shall apply to all companies who manufacture gas for sale, and shall take effect July first, eighteen hundred and sixty-one.

*Approved April* 10, 1861.

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CINCINNATI, O.—Water-works cost $1,359,500. Capacity of reservoir 5,000,000 gallons. Average daily delivery 6,000,000 gallons. Supply obtained from the Ohio river, 1,000 feet distant, and distributed through 74 miles pipe. The Worthington and Phillips meters are in use here and are found very accurate.

RISE IN THE PRICE OF GAS IN ENGLAND.—The Commercial Gas Company of London have issued notices that the price of gas, will, at midsummer, be raised in their district (the eastern section of the city), from 4s. to 4s. 5d., per 1,000 cubic feet.

MR. YOUNG'S COAL-OIL PATENT.—Mr. Gillespie, of Torbanehill, has applied through his counsel, to Sir R. Bethell, for leave to issue a writ of *scire facias* to repeal Mr. YOUNG'S celebrated coal-oil patent. The application was refused.

## ON THE MANUFACTURE OF OXYGEN AND HYDROGEN.

By MM. SAINTE-CLAIRE DEVILLE and H. DEBRAY.

[Abridged from the *Annales de Chimie et de Physique.*]

### OXYGEN.

The manufacture of oxygen has required long consideration on our part to arrive, as we believe we have arrived, at producing it at a moderate price, in simple apparatus, and in a continuous manner. We have had successively to study all the known modes of extraction, because each of them seemed to us still capable of being improved upon, and because it might happen that the process selected might be beneficially varied according to the facilities met with in different localities in procuring the raw material, and also with their prices.

We commence naturally by the study of manganese as a source of oxygen, because it is the substance which we necessarily had first recourse to. We shall afterwards examine the production of gas from different salts, and, lastly, from sulphuric acid.

MANGANESE.—We have used very many varieties of manganese of different origins and of different prices. We shall now give the results we have attained, describing successively our process and apparatus for producing oxygen on a large scale, and shall conclude by giving an estimate of the cost prices of this valuable gas.

*Mode of Trial.*—Take a mercury bottle capable of containing 4 or 5 kilogrammes of manganese in powder and fragments, enlarge the screwed aperture in its upper surface, and fit in a length of wrought-iron tubing, bent at right angles at about a quarter of its length, and filed at the short end of the bent pipe, so as to present a slightly conical surface. This extremity must be forced into the opening of the bottle, which we suppose to have been previously filled with weighed manganese, and made tight by a luting composed of fire-clay and cow-dung. The chlorometric value of the manganese should be taken beforehand, so as to have some approximative information as to the quantity of oxygen it contains.

Place the mercury bottle in a furnace full of burning coke, the temperature of which is to be maintained at a bright red heat. The oxygen disengaged is caused to pass through a vessel provided with a safety-pipe, and afterwards through a solution of potash. The first vessel retains the acid water given off by the manganese; the potash retains the carbonic acid. The purified gas is received into a graduated gas-holder, and is measured on its way there by an accurately adjusted meter.

The following are the results obtained:

| Origins. | Degrees. of Chlorometric Value. | Litres of Oxygen from One Kilogramme of Manganese. |
|---|---|---|
| Romanéche | 55 to 60 | 34.3 |
| Spanish | 61 to 63 | 40.0 |
| Pyrénées | 70 | 41.1 |
| Giessen | 75 | 50.1 |
| Piedmontese | 90 | 60.0 |

The last three specimens of manganese were furnished to us by Messrs. Mangin, of Paris, and were chosen from amongst the non-calcareous varieties, which is an important consideration in the manufacture of oxygen.

No. 1, obtained at Romanéche, in the Morvan, is well known. It is ferruginous, and accompanied with quartz and fluate of lime. Its cost is 10 francs the 100 kilogrammes. It was supplied to us by M. Merle, of Allais, who purchases it at this price.

No. 2—Spanish—costing 16 francs the 100 kilogrammes at Paris, must be of small value at the mine. We are not aware of the precise locality from which it is obtained. It would be very advantageous if it could be had in large quantities; but we have not been able to procure sufficient information in this respect.

No. 3—Pyrénées—is a very fine specimen, containing many kidney-shaped pieces of great purity, and very well crystallized. The black and compact pieces, treated with acid, leave an abundant residue, composed of sand and argillaceous matter. This manganese is procured at Bagnères de Luchon and its environs, and is worth 18 francs the 100 kilogrammes at Paris. It is the description we have used in the greater number of our experiments.

No. 4—the manganese of Giessen—which is that used in all our laboratories for the production of chlorine. It was sold to us in Paris at 27 francs the 100 kilogrammes.

No. 5—Piedmontese. This manganese, which is obtained at Traverselle, is of great purity, and much sought for by glass manufacturers. Its value in Paris is 40 francs the 100 kilogrammes.

The oxygen collected under these circumstances is far from being pure. Even when all necessary precautions have been taken to expel the air from the vessels, a considerable proportion of nitrogen is still found in the collected gases. We have analyzed them, in seeking for carbonic acid, by potash, and in estimating the oxygen by the reagent of M. Liebig—the alkaline pyrogallate of potash, which is very suitable for this purpose. The nitrogen remains, and its negative properties may be proved; so that no possible doubt can remain as to its nature.

The following are the results of our analyses:

| | No. 1. Romanéche. | No. 2. Spanish. | No. 3. Pyrénées. | No. 4. Giessen. | No. 5. Piedmontese. |
|---|---|---|---|---|---|
| Oxygen | 94.6 | 93.7 | 94.5 | 94.0 | 96.4 |
| Nitrogen | 5.4 | 6.3 | 5.5 | 6.0 | 3.6 |
| | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Since the days of Scheele, it is well known that oxygen obtained from manganese contains nitrogen, and that this gas is given off at the commencement of the preparation. Berzelius had even observed that the gas from manganese possessed a slightly nitrous smell. This smell, which we have often observed, we ourselves attributed to the presence of ozone; but as the gas collected at every stage in the manufacture of oxygen always contained nitrogen, we were induced to seek in the manganese itself the permanent matter which furnished a gas whose presence was very inconvenient in our metallurgic operations.

All the manganese that we have examined up to the present time contained considerable quantities of water. Sixty kilogrammes of the Giessen manganese gave 5 kilogrammes of water, of which the reaction was sensibly acidulous. If this water is evaporated, after having been exactly saturated with pure potash, 15 grammes of nitrate of potash and about 5 grammes of the chloride of potassium are obtained. The absence of nitrates in the crystallized salts makes us think that chlorine and hyponitric acid are the two gaseous products which are condensed.

It appears, then, to be very probable that manganese may contain nitric acid, unless the ammonia (undergoing by contact with oxygen and manganese a total combustion analagous to that which is produced in the celebrated experiment of Mr. Kuhlman) be not the source of the nitric acid condensed. We have washed with weak sulphuric acid 250 grammes of manganese finely powdered, and have only found in the solution 4 millegrammes of ammonia, which the two litres of distilled water employed may very readily have contained.

In boiling 500 grammes of powdered Giessen manganese with one or two litres of water and 10 grammes of carbonate of potash, and then treating the filtered liquor by acetic acid very slightly in excess, and evaporating to dryness, there is obtained a saline residue, which, washed with boiling alcohol of 80°, gives up its nitrate, which crystallizes in cooling.

Finally, in digesting 500 grammes of this manganese with pure water, and evaporating the filtered solution, there is obtained a saline deposit, which has the following composition:

| | Millegrammes. |
|---|---|
| Sulphate of lime | 103 |
| Chloride of calcium | 205 |
| Chloride of magnesium | 84 |
| Chloride of sodium | 174 |
| Nitrate of soda | 353 |
| Nitrate of potash | 629 |
| | 1548 |

Each kilogramme of this manganese gives up, therefore, to water 3.096 grammes of soluble substances entirely neutral. We are warned of the presence of nitrates in these substances by a circumstance which it is of importance to observe in the analysis. When it is desired to expel by heat, the acetate and oxalate of ammonia which have been introduced during the

operation, there is manifested in the last moments of the process a vivid combustion and a deflagration sufficiently strong to cause loss, which cannot always be avoided even if the vessel is covered with a funnel.

It is difficult to explain the natural formation of binoxide of manganese, which is never produced by direct oxidation, and which we can only obtain in our laboratories by the decomposition of manganic acid or of nitrate of manganese. Our analyses would rather induce us to believe that the manganese is derived from the nitrate for the neutral or acid nitrate of manganese dissolved in water, and heated in closed vessels to about 150°, leaves a shining deposit of black binoxide, having its surface covered with rounded protuberances like certain of the natural manganeses, but in no degree crystallized. This experiment which M. de Senarmont has made, and which we have repeated, having rendered the presence of nitric acid in natural manganese probable, warrants the opinion that we have just developed.

But M. de Boussingault, who has analyzed a great number of samples of manganese, and who has constantly found nitric acid present, attributes the presence of this acid to the filtration of fluvial waters charged with organic matters into the earth in which the beds of manganese are found. This explanation is rendered very probable in most of the cases that he has examined, by its being shown that nitric acid is really found in all the substances that have been in contact with rain-water.

There is, besides, another consideration which tends to render this question unsettled. According to the analysis No. 4 of the gases obtained in the decomposition of Giessen manganese, supposing, which is scarcely probable, that we had completely expelled the air from our apparatus before analyzing the gas, according to the proportion of oxygen that we extracted from this manganese, it should have contained 3.6 per cent. of nitrogen; while the direct analysis previously alluded to proves only the presence of 1-1000th part of nitric acid. It must be admitted that nitrogen is there found in a particular state still unknown, and that further experiments are necessary for its search. We willingly admit that our own results, although sufficient for the purposes for which we publish them to-day, do not dispense with those minute researches which we propose to undertake for the purpose of elucidating this interesting question.

In a practical point of view, this impurity of manganese has really no inconvenience, and the following experiment proves it:—We mixed oxygen with about one quarter its volume of atmospheric air, and with this mixture, which contained 82.7 per cent. of oxygen, and 17.3 per cent. nitrogen, we melted 10 kilogrammes of platinum with 1.200 litres of the mixed gases. This single operation could not have succeeded much better had the oxygen employed been entirely pure.

In ascertaining the combustion-supporting power of oxygen at the moment when it began to be given off in our apparatus, we several times experienced a violent explosion. We can only explain this explosion by the accidental or fraudulent presence of organic matter mixed with the manganese. It will, therefore, always be prudent to assay the gas by means of a small *eprouvette*, when it is desired to prepare oxygen from a manganese upon which no experiments have been made.

Our cast-iron bottles were constantly used for more than six months. We had four of them. One, which had a defect, broke after being heated two or three times. Of the three others, two are still in a serviceable state, one only having been destroyed by fire during the last day of our operations. In breaking it, we observed that the cast iron was transformed upon one portion of its thickness, both internally and externally, into a very compact magnetic oxide, impervious to gas, and offering a very great resistance. The centre part was unchanged. The portion which had given way corresponded accurately to an opening resulting from an imperfection in the casting, which had been plugged up by an iron rivet, of which the heads were beaten upon the casting.

We believe that cast-iron bottles, properly made and well proved, will last for more than twelve months in constant service. For this reason, we think that the price of these botttes will not form any very considerable portion in the cost price of oxygen manufactured from manganese. Each of these bottles weighs 26 kilogrammes, and costs 36 francs the 100 kilogrammes.

When these bottles are used for the first time, the carbon adhering to the surface of the iron produces a considerable quantity of carbonic acid, and the yield of oxygen is thereby diminished. As a proof of this, we may state that before our washer was finished, the gas traversed a vessel of the capacity of five litres, full of fragments of potash. In absorbing the carbonic acid, the temperature of this vessel increased more than 100°, and the gas was not so completely deprived of its carbonic acid as it would have been by our washer. 66 kilogrammes of Giessen manganese produced 2.250 litres of oxygen, the composition of which was—

| | |
|---|---|
| Nitrogen and oxygen | 96 6 |
| Carbonic acid | 3·4 |
| | 100.0 |

The gas was measured by a meter between the washer and the gas-holders.

*(To be concluded.)*

## THE ORIGIN OF COAL.

By Robert Hunt, Esq., F.R.S.

Before we can enter on the question of the origin of coal, it is necessary to state how we determine it to be of vegetable origin.

It has been said, by some microscopic observers, that a true ligneous structure can be detected in coal; this is, however, denied by our most eminent botanists. Plants, in great abundance, are found preserved in the coal measures; but these are not in the state of coal. However, the chemical constitution of coal clearly indicates it to have originated from plants. The vegetable world consists, essentially, of carbon, combined with the two gaseous bodies which form water—hydrogen and oxygen; and coal is formed of the same elements, differing only in the proportions in which they are combined. The progress of the change, from a living tree growing in the sunshine, to a dead lump of coal lying deep in the earth, is indicated to us, if not exactly determined.

Every one must have observed decaying wood. Whether the decay goes on by the process of *dry* or *wet* rot, it is still a case of slow combustion. The carbon is attacked by the oxygen—that, in every way wonderful gas, which is at once the supporter of life and light, and the destroyer of all things. By this combination a gaseous acid—carbonic acid—is formed and expelled, leaving, relatively, an increased quantity of carbon behind. Thus we have dark and dusty rotton wood in the works of art, and we have *brown coal* or lignite, in which the woody structure is preserved, in the products of nature. Chemistry shows us the kind of change which takes place; and although it does not explain to us the conditions under which the change occurs, it gives us an intelligible result:

| | Carbon. | Hydrogen. | Oxygen. |
|---|---|---|---|
| Wood contains | 49.0 | 6.0 | 45.0 |
| Lignite " | 60.0 | 5.9 | 31.4 |
| Coal " | 80.0 | 5.3 | 14.7 |

With this chemical evidence in support of the hypothesis that coal is altered vegetable matter, let us proceed to the examination of the physical conditions under which it was formed.

Geological research indicates a period in the history of our own land when the sea washed around an extensive group of low islands, formed of the older granitic and slaty rocks, from the waste of which the old red sandstone rocks were forming. In the course of ages these almost land-locked seas became shallower, and the deposited matter rose around the margins, towards the surface of the waters. Myriads of strange and beautiful fish sported in the waves, which glowed with the reflection of a sun tropical in the intensity of its light and heat. On the slopes of the shores the coral animals were working in those days, as they are now laboring in the Pacific Ocean, forming their calcareous cells, so beautifully preserved in the limestones of Derbyshire and Devonshire.

Thus, by the wearing down of the land, and by the active agencies at work in the waters, vast tracts of low, swampy lands were formed.

These vast morasses, and the shallow waters of widely spread lagoons, became the abodes of a wild, a strange, vegetation. Tree ferns rose high into air, and spread their fronds so thickly that deep shadow reigned forever in the groves. Hosts of smaller ferns, almost infinite in variety, luxuriated in those shades—succulent plants, like the sigillaria and club mosses, abounded; and other mosses and fungi covered the damp ground. Vegetable life was abundant—to a degree which we can scarcely realize. Amongst these teeming organisms, one of the most remarkable is the plant known as *Sigillaria*. "They are generally," says Dr. Hooker, "but a few feet high, though sometimes two yards broad at their expanded bases; they are truncated at the top. * * * So common are they, that I have, in many South Wales and other collieries, counted five or six in the space of a few fathoms, always suggesting the idea of the erect stumps of trees in a forest." *Stigmaria*—long, serpent-like roots, shooting off from a centre into the mud in which they grew—were once thought to be a peculiar, a distinct, form of vegetable growth. They are now ascertained to be the roots of the *Sigillaria*.

These plants appear to have been of a very lax fibre. They grew, in all probability, to an enormous size with great rapidity, and as speedily decayed—forming and adding to the mass of *humus* which fed the mighty grasses, ferns, and mosses, clustered and matted around the larger trees.

Vast swampy plains like those were thickly spread with the *Sigillaria*, sending their vast roots far over the mud, to absorb speedily the water required for their rapid growth. Graceful *Lepidodendrons* grew in abundance,—these were gigantic arborescent club mosses, bearing, at the ends of their graceful leaves, their cone-like fruit.

There, again, were vast spaces covered with huge "horse tails"—the *Esquisetum;* and on the soft, marshy silt of the river's edge and estuary, grew forests of reeds—*Calamites*. Ferns and mosses combined with these, and formed a mat of vegetation which rapidly filled the shallow water. Floating in the deeper parts were found the *Asterophylites*. There were numerous varieties of this plant, all of them remarkable for their graceful forms, and apparently all growing in water sufficiently deep to float their branches and leaves. Under the influence of strong solar excitation, the vital powers of vegetable nature were stimulated to the highest. This was also quickened by a high terrestrial temperature. We have evidences proving to us "that, in the ancient world," to quote the words of Humboldt, "exhalations of heat, issuing forth through the many openings of the deeply-fissured crust of the globe, may have favored, perhaps for centuries, the growth of palms and tree ferns, and the existence of animals requiring a high temperature, over entire countries where now a very different climate prevails." There is little doubt that such were the conditions when a teeming vegetable world drew its carbon from the atmosphere, in which it existed in the form of carbonic acid. That, under those conditions—life being at its maximum of power—these plants decomposed this carbonic acid; and, giving back the oxygen to the air, built up with rapidity their woody structures with the carbon thus obtained. These plants died, and decomposed—through the same agencies—as rapidly as they grew, forming dense beds of black matter, which were slowly resolved into the state of coal. Contemplate for a moment the length of time required to form a bed of coal such as that which exists in South Staffordshire, having a mean thickness of thirty feet. This is unusual; but even to form a coal bed of but one yard in thickness must have required a long lapse of ages!

It has been somewhat too hastily said that coal is formed directly from wood, and that much of it is found to retain its woody structure. There is, as before stated, great doubt on this point. That wood may be *eventually* converted into coal is admitted—but in changing, it entirely loses the form of wood—retains no evidence of fibre. It may, under the influences of heat and moisture, be converted into a bituminous mass, which is eventually consolidated into coal; but we cannot discover any evidence of wood being transmuted directly to coal. The remains of woody trees

found fossil in the coal measure strata may be silicified—may become limestone, may be iron ore—certain it is they are never coal. The probability is, that the coal mass itself was produced from cactus-like plants, from club mosses, or peat mosses, or from aquatic plants, either marine or fresh-water.

The vegeteble mass, whatever may have been its origin, from which our beds of fossil fuel is derived, may have been formed from plants which grew on the spot where we now find it; and the *under-clay*, as it is called, is supposed to be the soil in which the plants grew; or it may have been removed by the waters in a plastic state, floated out into the deltas or seas, and eventually, in obedience to the law of gravity, have sunk to the beds of the then existing waters.

Knowing that many of these coal beds are now several thousand feet below the surface, we have either to suppose—if we adopt the first hypothesis—a gradual subsidence of the earth to the depth at which the coal is now found; or, if we prefer the second, to imagine the filling up of the seas, after the coal has been deposited, by enormous beds of sandstone or of shale. Sir Henry de la Beche describes a section near Swansea having a total thickness of 3,246 feet; in this there are ten principal masses of sandstone, one of these 500 feet thick. They are separated by masses of shale, varying in thickness from ten to fifty feet, The intercalated coal beds, sixteen in number, are generally from one to five feet thick—one of them, which has two or three layers of clay interposed, attaining nine feet. —*Memoirs of Geological Survey.*

Taking this instance only, we learn that there have been sixteen different formations of coal; that these have—each one of them—been covered up with hundreds of feet of sandstone and shale. The subsidence of the earth's crust is surrounded with difficulties of no common order—the filling up an ancient sea to the depth of more than 3,000 feet requires conditions which we can scarcely conceive to have existed—and in either case we seem to require ages of repose, during which a beautiful Flora drank in the sunshine—then cataclysmal action destroying all—followed by ages during which sand was deposited, bearing down with it but little evidence of their being any vegetable life.

Science has advanced far into the secrets of the earth's changes; but let us not deceive ourselves by supposing we have yet heard the voice of Nature proclaiming the true phenomena of our coal formations.—*St. James's* (*London*) *Magazine.*

EMPLOYMENT OF GAS TO GENERATE STEAM.—Steam for housing and other purposes, generated by means of gas, was successfully put into operation at Mr. Taylor's engine-works, Birkenhead, England, on Monday, June 3, and we feel sure it must come into general use for that purpose, and particularly for employment where small power is required. The patentee is Mr. Arthur Jackson, of Liverpool. It is of importance to know that the subject has been laid before the northern board of fire offices, who, we have been given to understand, do not object to its application in the Liverpool mercantile warehouses, if placed on the ground or first floor. This is a grand point, as it will gradually relieve the crowded state of many thoroughfares in that town. Among the gentlemen who attended were Mr. Miller (the representative of Mr. Hartley, the dock engineer), Mr. Rees, chairman of the Liverpool Corn Association, Mr. Robert Makin, Mr. Joseph Boult, Mr. Weightman, Mr. Rounthwaite (Mersey dock board), Mr. Edwards (Liverpool gas-office), &c. We shall allude to this subject again in a future number; in the meantime we must say that the safety and cleanliness of gas are in themselves a powerful recommendation.

KEROSENE OIL FACTORY BURNED.—On Monday night, July 15th, the kerosene oil factory at No. 333 Stanton street, New York city, was discovered to be on fire, occasioned by the ignition of volatile gas which had escaped from the still. The flames raged furiously, and communicated with a row of stables on Mangin street, which were soon destroyed. Eight horses were burned to death, beside the destruction of carts, harness, and other property, owned by different individuals. The factory was owned by Messrs. McCreary & Co., and their loss is estimated at $5,000.

## FOREIGN NEWS.

### RECENT ENGLISH PATENTS.

A patent has been recently granted to William Renwick Bowditch, of Wakefield, England, for "*Improvements in the purification of coal-gas and of coal oils,*" in which the hydrates of potash, soda, baryta, magnesia, or alumina, or the oxides of manganese and of iron either in the hydrated or anhydrous condition (except hydrated peroxide of iron,) are used as agents through or over which coal-gas is passed. Other oxides, such as those of copper, zinc, or tin, will produce the same effect; but, at their present prices, are too expensive to be employed. The gas may be likewise passed through a mixture of these substances, at a temperature between 120° F. and a little short of dull redness, the best temperature being about 300° F. The above materials, except potash and soda, are best fitted for use in the purification of coal gas, when they are in small lumps, from the size of a pea to that of a walnut, as the gas then passes through them with facility. If in a state of powder they may be formed into small lumps, by moistening with water and stirring until they aggregate into lumps. They are then to be dried, and to have the dust sifted out, when they are ready for the hot purifiers. The best temperature for drying these substances is from 200° to 300° F. Potash and soda are employed when dissolved in water, and absorbed in small pieces of bricks. When saturated with the alkaline solution, the bricks are ready for use in the hot purifiers.

The vessels used to hold the heated purifying materials may be of any size, shape, or material found convenient. It is preferred to have them cylindrical of cast-iron, with a door on each end. Each vessel should have a steam jacket, so that steam could be used to heat the materials.

The vessels for holding the purifying materials and the mode of placing them in position are essentially similar to those described in another patent to the same person, and mentioned on page 220, vol. II., of this JOURNAL.

This invention may be applied to gas by consumers upon their own premises; in which case, the gas which leaves the meter is made to pass through a small purifier containing the above-mentioned purifying materials, heated to about 300° F., and subsequently, through another purifier, containing layers of ordinary cold slaked lime; after which it may be burned. The pressure of gas upon consumers' premises is not often sufficient to overcome much resistance; wherefore the cold purifying materials should have the dust sifted out, and then the gas will pass through the purifiers without any perceptible loss of pressure.

Another part of this invention is in the passing coal-gas, together with steam, through or over coke, charcoal, or mixtures of these, or either of them with alkalies, or through the materials above named, or mixtures of them heated between 212° F. and a dull red heat, preferring for the latter materials a temperature of about 400° F. For this purpose, the charcoal or coke is broken into small pieces, from which the dust is sifted, and (if alkalies are used) the charcoal or coke is saturated with concentrated solutions thereof, when it is fit for use in the hot purifiers.

Coal-gas contains steam, or vapor of waters, and, when the gas containing this normal quantity of vapor is passed through or over the above-named materials, some of the sulphur, which was before irremovable, can be removed by cold slaked lime. It is preferred, however, to add to the gas more steam than it contains naturally, and the best plan is found to be to send the gas over the surface of water, heated from about 140° to 180° F.; and subsequently, through the above-named heated materials. The quantity of steam thus carried by the gas is found to be the best which can be employed. The surface of heated water should be about 25 superficial feet for each 50,000 cubic feet of gas made per hour. When steam is generated at and above the boiling point of water, and passed with gas into the hot purifier, a considerable amount of illuminating matter is abstracted from the gas, without any corresponding advantage in point of purity. The charcoal or coke when used alone may be heated to about 500° F.; but with alkalies, it should not be heated above 300° F. When the gas leaves the coke or charcoal it is to be cooled and purified as described above.

Another part of this invention is the passing coal-gas with steam through heated pipes or other suitable vessels, heated to about 500° F. and filled with any inert material, such as broken bricks, to afford surface of contact, so that the gas and steam may be brought into intimate contact. A pipe or vessel 4 feet long, filled with brick or other inert material, will be sufficient; but, when nothing is used to fill up the heated pipes or vessels, this should be from 8 to 10 feet in length. The aqueous vapor existing in gas will of itself suffice to convert a part of the irremovable sulphur compounds of gas into removable compounds; but is preferred to add steam, and to effect this the gas is passed over a surface of heated water as is above specified, after which the gas is to be passed through the cold purifiers as above described.

Another part of this invention consists in passing coal oils (that is such oils as have been obtained by the distillation of coal, schist, or coal-tar) through vessels containing any of the above-named substances heated to 380° F., and prepared as directed for use in the purification of gas. The best and most economical substance of all the above named is binoxide of manganese, and the best mode of proceeding is to take the coal-oil, after it has been treated with acids and alkalies in the usual manner and to distil it over the heated purifying material. When condensed the coal-oil is to be washed with alkali, and subsequently with water, upon which it becomes quite colorless or nearly so, and of a pleasant odor. When the washing, as directed, after it has passed through the heated purifying material, does not produce an oil of good color or odor, the hot manganese or other purifying material should be changed.

The patentee claims, as the first part of his invention, the application to the purification of coal-gas of the substances named above, heated and having the gas transmitted through them, subsequently to which the gas is passed through the ordinary cold purifying materials, by which treatment of gas, injurious matter, irremovable by the ordinary cold purification, are rendered removable and are removed. He claims, as to the second part of the invention, the passing coal-gas with steam, either that ordinarily contained in it, or added to it, over the substances named in describing that part of his invention, and in manner described, whereby similar effect is produced. He claims as to the third part of his invention, the passing gas through pipes or vessels as above described, whereby a similar effect is produced; and he claims fourthly, the purification of coal-oils, as herein described.

A patent has also been granted to F. J. Evans and G. F. Evans, for *improvements in the purification of gas.* This invention relates, first, to the purification of coal-gas after condensation and previously to its undergoing the ordinary purification, by mixing with the foul gas, atmospheric air or pure oxygen, and then heating the gas to a temperature, varying according to circumstances from 200° to 400° F., and while in this heated state passing the same through a purifier or other convenient vessel containing charcoal, coke, asbestos, chalk, asbestos and spongy platinum, or other equivalent substance previously heated to the temperature above mentioned. During the passage of the gas through the heated purifier, the sulphur compounds in the gas appear to be decomposed, and sulphurous and sulphuric acid is produced, and which combines with the ammonia existing in the gas, or may be passed through a solution of gas liquor so as to be absorbed. By this method the gas is wholly or in part deprived of its sulphur compounds, and if thought desirable, it may be further subjected to any of the known modes of purification. The invention relates, secondly, to the freeing from its sulphur compounds gas that has already undergone the ordinary process of purification, and which is known as pure gas. For this purpose the inventors use the same means as that above described for treating foul gas.

CLEVELAND, O.—Water-works cost $500,000. Capacity of reservoir 6,000,000. Average daily delivery 800,000. Supply obtained from Lake Erie 1 mile distant, and distributed through 23 miles pipe. Use Worthington's pump elevating water with 2 Cornish engines of 200 horse power each.

## PATENTS.

### UNITED STATES.

1,570.—F. B. McGregor, of Commerce, Mich., for an Improvement in Water Elevators:

I claim the arrangement of the receiving trough with the windlass, B, hooks, G, buckets, E, and short bars, F, in the manner and for the purpose shown and described; and in combination therewith I claim the arrangement of the bail, K, with the pawls, J J, and double ratchet wheel, L, in the manner and for the purpose shown and described.

1,572.—Nathan Miller, of Finley, Ohio, for an Improvement in Water Elevators for Cattle:

I claim the combination of the tilting platform, H, with the platform, F, when the latter is connected to the plunger, C, which is fitted within the cylinder, B, and provided with the eduction or water discharge tube, I, all arranged to operate as and for the purpose set forth.

[The object of this invention is to obtain a pump of simple construction that will admit of water being readily elevated by stock.]

1,573.—Nathan Miller, of Finley, Ohio, for an Improvement in Pumps:

I claim the combination of the platform, I, box, A, and plunger, B, provided with the tube, C, when the platform and plunger are connected by the levers, E, and uprights, G H, arranged substantially as and for the purpose set forth.

[This invention relates to an improvement in that class of pumps in which the water is elevated by a direct pressure of the piston, instead of the pressure of the atmosphere. The object is to obtain a pump of the class specified which may be operated with facility, be simple in construction, and capable, by manual operation, of elevating water to any desired height in dwelling houses for domestic use, or capable of elevating it in out-buildings or other localities, by means of the cattle or stock, the latter raising their own water.]

1,576.—Eli Mosher, of Flint, Mich., for an Improvement in Water Elevators:

I claim, first, The adjusting shaft, y, in combination with the hoisting apparatus described, all being arranged and operated in the manner set forth.

Second, I claim brake, x, serrated plate, v, adjusting shaft, y, ears, a a, stops, c c, and hoisting apparatus, when all shall be arranged and operated in the manner and for the purpose specified.

1,588.—V. Weitz, of Cleveland, Ohio, for an Improvement in Pumps:

I claim the arrangement of one piston rod within and concentric with another hollow piston rod, when used in combination with a pump cylinder containing two pistons working opposite to each other, in the manner and for the purpose described.

Also the relative arrangement of one piston rod working through and concentric with another hollow piston rod, and of a vibrating arc, chains and guide rollers, in the manner and for the purpose described.

Also, in combination with the preceding, the relative arrangement of a discharge tube perforated at the bottom end, an elastic reservoir and hose, as described.

1,603.—Nathan Barrett, of New York City, for an improvement in Pumps:

I claim the two pump cylinders, D D, attached to the ends of a walking beam, B, counterpoised thereon, and having their piston rods, F', connected by levers and gearing or segments, in such a manner that the pistons will be operated automatically by the oscillating of the beam, B, and all arranged to operate as and for the purpose set forth.

[The object of this invention is to obtain a pump which, in its operation, will lift only the amount of water it discharges, the weight of the whole column of water which is lifted in the ordinary lift pumps being avoied. To this end two pump cylinders are employed which are connected to the ends of a walking beam and connect the piston rods by suitable gearing and levers, one cylinder being made to balance the other, and the whole so arranged that the desired end is obtained.]

1,616.—A. W. Dewey, of Boston, Mass., for an improvement in Water Elevators:

I claim may improved water elevator, having its separate parts, viz., its wheel, C, bent arms, a a, &c., chain, D, buckets, E E, &c., and the cams or trippers, H H, constructed and arranged in relation to each other, and so to operate together, substantially as shown and described.

1,627.—A. Lebkucher, of Belleville, Ill., for an Improvement in Lubricating Compound:

I claim the lubricating compound derived from the use of rosin oil, muriatic acid, zinc, lime, olive oil, and water, in the manner herein set forth.

[This invention consists in a compound produced by mixing rosin oil (which has previously been refined by means of zinc dissolved in ether) with pure slaked and powdered lime as about the proportion hereinafter described, together with a certain quantity of olive oil and soft water, which is added after the mixture of rosin oil and lime has been heated and allowed to settle, thereby producing a lubricator, which, while it will economize power and prevent wearing, will not become gummy and glutinous, but keep the journals and other parts to which it may be applied, cool and so as to be easily cleaned.]

1,628.—Joel Lee, of Galesburg, Ill., for an Improvement in Water Elevators:

First, I claim the slotted lever, N, in combination with the brake, P, for the purpose of unclutching the crank, as described.

Second, The combination and arrangement of the pawl, O, and brake P, as described and for the purpose set forth.

Third, The spring, R, in combination with the slotted lever, N, for the purpose of clutching the crank and raising the brake from the catch, thereby permitting it to fall into the rachet as described,

Fourth, In combination with the forgoing enumerated devices, a horizontal bail or hoop placed at or near the top of the bucket, k, for the purpose of preserving the equilibrium of the bucket and affording convenience in dipping small quantities of water therefrom, when desired as described.

1,644.—George Race, of Norwich, N. Y., for an Improvement in Water Elevators:

The rachet C, with barrel, *d*, attached, placed loosely on the windlass shaft, *a*, in connection with the wheel, E, on the windlass shaft, a, and the spring, F, and eccentric and brake G *g*, on lever, H, all arranged substantially as and for the purpose set forth.

I further claim the particular arrangement of the spring, F, substantially as shown and described, whereby the spring, E, is made to perform the double function of a friction brake and spring, as set forth.

[The object of this invention is to obtain a water-elevating device which will admit of being operated with greater facility than usual. The invention relates to that class of water elevators in which a windlass and bucket are employed, and consists in the employment or use of a rachet placed level on the windlass shaft, in connection with a wheel attached permanently to the windlass shaft, and encased within a barrel attached to the rachet, said wheel being acted upon by a spring and an eccentric and brake, whereby the bucket may be elevated by the rotation of a crank, and released at any time so as to descend in the well as gradually as may be desired, and suddenly stopped at any desired point, the descent of the bucket being under the perfect control of the operator.]

1,651.—M. A. Shepard, of Bridgport, Ill., for an Improvement in Water Elevators:

I claim an oscillating or swinging box, C, divided into two compartments, c c, by a central partition, b, and said compartments subdivided into compartments e e' by partitions, f f', the compartments, e e', communicating with each other by openings, *g g'*, and all arranged to operate substantially as and for the purpose set forth.

[The object of this invention is to obtain a simple device for elevating water and other substances, either by the oscillating of the device alone on suitable journals, or by the rocking of the support to which the device is attached. The invention is applicable to vessels of navigation, serving, while the vessel is in motion, as a self-acting means for elevating water from the hold.]

1,654.—Leopold Thomas, of Alleghany, Pa., for an Improvement in Valves:

I claim attaching the piston rod of lifting pumps, by which the plunger is operated, to the upper valve itself, in such a manner as that the first part of the motion of the piston rod, either on its up or down stroke, shall be to open or close the valve, as the case may be, while the plunger itself is moved by the further stroke of the piston rod, substantially in the manner described.

1,657.—M. D. Wilder, of Laporte, Ind., for an Improvement in Water Elevators for Cattle:

I claim, first, The carriage, C, placed on a circular track, B, in connection with the annular apron, D, frame, J, fence, K, and pump formed of the reciprocating tube, Q, plunger, R, and cylinder, S, the pump being operated from the carriage, C, and all arranged substantially as and for the purpose set forth.

Second, The arrangement, as shown, of the annular trough, L, straight trough, M, and stationary curved discharge pipe, V, whereby the water is discharged into the straight trough, M, the motion of the trough not interfering with the proper delivery of the water.

Third, The arrangement of the shaft, E, crank pulley, F, connecting rod, P, collar, O, and rotating tube, H, substantially as shown, to serve as a means of communicating power from the carriage, C, to the pump.

Fourth, The employment or use of the decoy vessel, N, when used in connection with a pump and its operating mechanism, substantially as and for the purpose specified.

[This invention relates to a new and improved water-elevating device by which stock may raise their own water, and to which a horse may be applied when necessary for raising water. The invention consists in the use of an annular apron placed on a carriage and circular track, in connection with a fence and pump, all arranged to effect the desired end.]

1,666.—G. H. Smith (assignor to S. O. Smith), of Rochester, N. Y., for an Improvement in Gas Regulators:

I claim, first, The employment in portable gas regulators of a long, cylindrical valve, operating as described, and moved longitudinally by means of the back pressure of the gas upon an overcharged cushion of confied air, to the covering of which the valve is connected.

Second, Attaching the valve to one leaf of a double diaphragm, or to a ring of rubber attached to the single diaphragm, substantially as and for the purposes set forth.

1,672.—N. Aubin, of Albany, N. Y., for an Improvement in Dry Gas-Holders:

I claim a dry gas-holder composed of a lower and rigid vessel, and an upper flexible vessel, attached each to the other, and constructed and operating substantially in the manner described, by the combined action of the pressure of the gas and that of a disk, or weight, and this I claim, irrespective of the precise method of attaching the edge of one vessel to the edge of the other.

1,695.—A. W. P. Ladd, of San Francisco, Cal., for an Improvement in Faucets:

I claim the combination of a faucet and augur, B, with a horn or projection, C, when arranged in relation to each other as and for the purpose described.

1,700.—Joshua Merrill, of Boston, Mass., for an Improvement in the Distillation of Hydro-carbon Oils:

I claim the described mode substantially of using caustic alkali, by aid of a pan, as set forth.

1,701.—Joshua Merrill, of Boston, Mass., for an Improvement in the Manufacture of Hydro-carbon Oils:

I claim the described improvement in the process of purifying hydro-carbon oils, by treating the first distillate with acid residues, substantially as described.

1,702.—Joshua Merrill, of Boston, Mass., for an Improvement in the Construction of Stills:

I claim the formed seamless wrought-iron still bottom, substantially as described, and substantially for the purposes set forth.

I also claim the still as a whole, consisting of a cast-iron top, wrought-iron sides, and wrought-iron seamless bottom, combined together by angle iron couplings, substantially as described, for the purpose of making a comparatively light and durable hydro-carbon oil still.


**PORTABLE GAS-WORKS.**

MARSH'S PATENT ROSIN OR Sun-Light Gas-Works, for Private Dwellings, Hotels, Factories, Railway stations, Sugar-houses, Towns, &c. By the peculiar construction of the Retorts, the largest amount of decomposing surface is obtained in the smallest space. 2d. Gas is manufactured from crude rosin, without the least deposit of carbonaceous matter in the retorts or pipes: thus enabling them to be operated continuously, generating rapidly the best and cheapest illuminating gas obtained from this material. ALFRED MARSH & CO.
241 Broadway, New York.

MARYLAND GAS COMPANY are constantly constructing their superior Patent
**PORTABLE GAS-WORKS,**
of any capacity, from that required for Private Dwellings, Public Buildings, &c., to such as will supply Cities and Towns, complete in all their parts, for the manufacture of Gas from either Rosin, Oil, Coal, or Rosin.

P. S.—This Company also manufacture a superior article of ROSIN-OIL, especially for Gas purposes. Their experience for the last nine years has secured for them a perfect success of their Gas-Works. Address
Maryland Gas Company, Baltimore, Md.

PORTABLE GAS WORKS.—S. T. McDOUGALL'S PATENT Portable Gas Works, for making Gas from Rosin, Rosin Oil, Coal Oil, Naptha, Grease, etc. These Works combine the latest improvements in gas making, and are guaranteed to be superior to any in market. They are made of all sizes, suitable for either country or city use. No county house is complete without its Gas-Works. Gas Stoves of every description on hand and made to order. For sale by S. T. McDougall, 170 Center St., New York.

Agents wanted in other cities to sell rights or machines.

**PORTABLE GAS-WORKS.**

BUTLER'S PATENT PORTABLE
**ROSIN GAS-WORKS,**
FOR
*Dwellings, Churches, Country Villages,*
As well as for Consumers in Large Cities.
JOHN BUTLER,
No. 112 Fulton st. and 15 Henry st.,
Brooklyn, N. Y.

FOR LIGHTING RAILROAD CARS AND STEAMBOATS
☞ WITH GAS.
The whole process of Filling the Gas-Holders of a Railway Train, requires but Three Minutes.
Apply to the
NEW YORK CAR & STEAMBOAT GAS. CO.,
No. 117 Fulton st., N. Y.

APPLETON'S IMPROVED GAS-WORKS, for Factories, Hotels, Dwellings and Towns. The most simple and economical works in use, furnishing a superior light to coal-gas at a cost of one-half a cent per burner per hour. It does not injure trees, or plate, and is not affected by cold. For Circular and Terms, apply to APPLETON & GRAHAM,
56 Washington street, Boston.
For Engravings, see AMERICAN GAS-LIGHT JOURNAL for April, 1860, page 213.

C. R. WOODWORTH, Manufacturer of
**PORTABLE GAS WORKS,**
74 WALL STREET, NEW YORK CITY.

**GAS WORKS**
**TO LET.**
For particulars, address
D. CONGDON.
SAG HARBOR,
June 10th. 1861.

**WATER-METERS.**

H. R. WORTHINGTON'S PATENT Water-Meter.—This Meter combines accuracy, simplicity and remarkable durability, with such ease and certainty of motion, as to offer no appreciable obstructions to the flow of water in the pipes to which it is connected, as it runs and registers upon three inches head, or when delivering the smallest stream. These qualities, with its low cost, have caused its extensive adoption by corporations and individuals, in many of our largest cities.
HENRY R. WORTHINGTON,
61 Beekman street, N. Y.

JOSEPH NASON & CO., 61 BEEKMAN STREET, corner of Gold Street, New-York, Manufacturers of Wrought and Cast-Iron Pipes, and every description of Steam and Gas-Fittings used by Engineers, Manufacturers, and Gas-Fitters.

| | |
|---|---|
| Boiler Flues, | Back Pressure Valves, |
| Steam Boilers, | Steam Traps, |
| Boiler Pumps, | Steam Whistles, |
| Steam Pumps, | Gauge Cocks, |
| Steam Gauges, | Gas Cocks, |
| Safety Valves, | Gas Meters, |
| Stop Valves, | Fitters' Tools, |
| Check Valves, | Proving Pumps, |
| Governor Valves, | Screwing Machines. |

JOSEPH NASON,
HENRY R. WORTHINGTON.

**SITUATION WANTED.**

BY A COMPETENT MAN, A situation as Superintendent or Inspector of a Gas-Works. Address GAS ENGINEER, Post-Office, Pittsburgh, Pa.

**SCIENTIFIC BOOKS.**

GAS ENGINEERS' LIBRARY.—A few works indispensable to Engineers, Contractors, and others engaged in the construction of Gas-Works and manufacture of Gas, have been selected, out of a large stock of chemical and other works, and are recommended to the attention of those interested. See page 208, vol. II, of this JOURNAL.

For sale at the Rooms of the AMERICAN GAS-LIGHT JOURNAL, New York.

**PLUMBERS & GAS-FITTERS.**

LOCKE & CRAIGIE, PLUMBERS and GAS-FITTERS, No. 12 East 20th street, New York.

LOCKE, CRAIGIE & CO., Gas-Fittings, Chandeliers, Brackets, Globes, &c., No. 927 Broadway, New York.
☞ Particular attention paid to country work.

JAMES HELME'S CHANDELIER AND Gas-Fitting Establishment, No. 58 East Thirteenth street, between Broadway and University Place, New York.

**ANTI-FREEZING APPARATUS.**

FREEZING OF GAS-PIPES.—Walton's Patent Anti-Freezing Apparatus illustrated by Engravings in the AMERICAN GAS-LIGHT JOURNAL, of Jan. 1, 1861, page 212, is the most simple, durable and efficient of any known process.

See also certificates from Cincinnati, O., and Louisville, Ky. Gas-Works in same number, page 208. Address, JOHN WALTON,
Sup't Gas-Works, Louisville, Ky.

THE
## STERLING GAS-REGULATOR,
**Improves the Light and Saves a Large Per Centage of Gas.**

MANUFACTURED BY THE
WHEELER & WILSON SEWING MACHINE COMPANY.

It is well known that Printers require the best and most brilliant light In proof of the superiority of these Machines over all others, the following New York establishments are using them, and testify to their excellence:—New York Times, New York Herald, New York World, New York Tribune, New York Sun, Journal of Commerce, Courier & Enquirer, Evening Post, The Zietung, Dispatch, Leader, Scientific American, Advertiser and Spectator, Independent, Daily News, Harper's Monthly and Weekly, Transcript, Mercury, Atlas, Life Illustrated, Albion, Spirit of the Times, AMERICAN GAS-LIGHT JOURNAL, Christian Enquirer, Churchman, Church Journal, Christian Advocate, Christian Ambassador, Christian Intelligencer, Observer, Sunday Times, Sunday Courier.

By order of the New York and Brooklyn Common Councils, these Regulators are now used in the City Halls, Police Stations, Markets, and other Public Buildings in both cities.

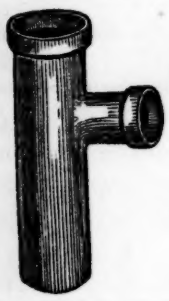
**They are Warranted by the**
**WHEELER & WILSON SEWING-MACHINE CO.,**
**505 BROADWAY, NEW YORK,**

To keep in order, and always maintain the pressurs of the Gas at the lowest point for a brilliant light and economical combustion. They are so constructed that *under no circumstances can the Mercury get into the Meters, or in any way injure them.*

## WARREN'S PATENT WATER & ALARM GAUGE,
**For Protecting the Flues and Preventing Steam-Boiler Explosions.**

This is a reliable High and Low Water Detector, arranged so as to render it one of the best Water Gauges ever attached to a Steam-Boiler; always presenting before the Engineer at sight the exact height of the water, and if, by oversight or by sudden leakage, the water gets low in the boiler, it will cause an alarm before the water gets below the flues, thereby preventing an explosion. This Gauge can be made to alarm at any point desired as a High Water Detector, thereby preventing the water from getting to that height as to be forced into the cylinder of the engine, often causing serious accidents. Thus it is a High as well as a Low water Detector. For sale by

WARREN & BANKS,
153 Centre st., corner of Canal st., New York,
Where a Gauge is constantly in operation.



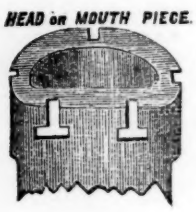
## GAS, STEAM, SMOKE,
## PURE WATER & SOIL PIPE,
FROM
**JOSEPH CLIFF,**
**Wortley Fire-Brick Works, Leeds, England.**
**T. W. PARMELE, Agt.,**
**No. 4 Irving Place, N. Y.**

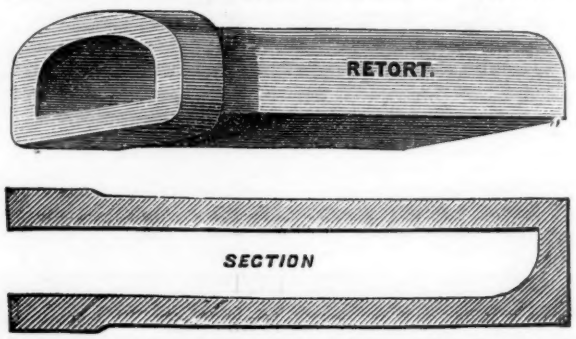
## JOHN RUSSELL & CO.,
## PATENT TUBE MAKERS,
THE OLD TUBE WORKS, WEDNESBURY, AND THE ALMA WORKS, WALSAL, STAFFORDSHIRE,
**69 UPPER THAMES ST., & 5 CHARLES ST., SOHO, LONDON;**
AND 35 GRANBY ROW, MANCHESTER, ENGLAND.

The original Manufacturers of WROUGHT-IRON GAS TUBES, and the Inventors of the Lap-welded Tubes for Locomotive and Marine Boilers. All kinds of TUBES and FITTINGS, whether for Gas, Steam, or Water. Galvanized and Composition Tubes. Chandeliers, and every kind of Brass work for Gas and Steam.

STOCKS, DIES, AND TAPS OF ALL SIZES. CAST-IRON PIPE AND GAS-METERS.
**All Goods Warranted.**

## KING BROTHERS,
## STOURBRIDGE, ENGLAND, FIRE-BRICK AND RETORT WORKS.



KING BROTHERS beg especially to call the attention of Gas Companies to the superiority of their Retorts, which are made from the celebrated STOURBRIDGE FIRE-CLAY. Mr. King has patented a Kiln for Burning Retorts, by which Patent all Cold Air is excluded from the Kiln while burning, thus rendering them

**Free from Cracks and Correct in Form.**

By great care in Manufacturing, combined with the advantages in Burning, a VERY SMOOTH SURFACE is obtained, rendering them less liable to carbonize.

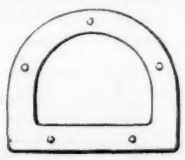
RETORT OVENS, FIRE-BRICKS, GUARDS, SADDLES, RABITTED BURS, FLUES, AND QUARRIES, ARE ALL MANUFACTURED OF THE SAME QUALITY OF CLAY.

**EVERY RETORT AND BRICK IS BRANDED "KING BROTHERS, STOURBRIDGE."**

Apply to E. W. BARSTOW, 83 Maiden Lane, New York, where samples can be seen.

## HARRIS & PEARSON,
PROPRIETORS OF
**Best Glass-House Pot & Crucible Clay.**
**Manufacturers of Fire-Bricks, Gas-Retorts, and Glass-House Furnace-Bricks of every description.**
AMBLECOTE FIRE-CLAY AND BRICK WORKS, STOURBRIDGE, ENGLAND.

## COWEN'S PATENT FIRE-CLAY RETORTS.



## JOSEPH COWEN & CO.,
**BLAYDON BURN, near Newcastle-on-Tyne, England,**

Have always been, and are still, the most extensive manufacturers of FIRE-CLAY RETORTS in the United Kingdom, and were the only parties to whom a Prize Medal was awarded at the Great Exhibition, in London, 1851, for

"GAS RETORTS, AND OTHER OBJECTS IN FIRE-CLAY."

J. C. & CO. make Fire-Clay Retorts of all shapes and dimensions, and to fit existing mouth-pieces.

Orders for FIRE-CLAY RETORTS, TILES, BEARERS, and other articles in Fire-Clay, receive immediate attention, and are promptly executed at their Works, as above. Drawings of Settings adapted for Cowen's Patent Fire-Clay Retorts supplied.

AGENTS, MESSRS. MEAD & BELL,
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N. B.—J. C. & CO.'S RETORTS are well adapted for small Gas-Works, as they can be used without an Exhauster.

MEDALS AWARDED TO THOMAS GLOVER'S PATENT DRY GAS-METERS.

MANUFACTORIES

SUFFOLK ST. CLERKENWELL GREEN. & ALLEN ST. GOSWELL ST. LONDON.

BOSTON, MASS., 1 BARRETT STREET,—August 2, 1860.

RICHARD GLOVER begs to inform GAS COMPANIES and CONTRACTORS that he has always on hand a large assortment of THOMAS GLOVER'S (of London) celebrated DRY GAS METERS.

THOMAS GLOVER'S Meters have now been in use in the United States and British Provinces, for the last FOURTEEN YEARS, and are extensively used by many Gas Companies, to their entire satisfaction; and R. GLOVER can with all confidence refer to them in proof that THOMAS GLOVER'S Meters are— the most PERFECT in PRINCIPLES— the most CORRECT in REGISTRATION—and more DURABLE than any other Dry Gas Meter made in the United States or Great Britain. R. GLOVER will at all times be glad to repair any Gas Meters sent him at the above factory. If any of them are of THOMAS GLOVER'S manufacture, and of a more recent date than THREE years, he will make no charge.

# DOWN & MERRIFIELD,

**Nos. 340, 342, 344 and 346 West Twenty-second Street, North River, NEW YORK CITY,**

MANUFACTURERS OF

## WET AND DRY PATENT GAS-METERS,

**Pressure-Registers, Pressure-Indicators and Gauges, Station, Show, Customer, and Experimental Gas-Meters, Centre or Hydraulic Valves, Governors, Compensators for Exhausters, and the Standard, Testing Gas-Holders* for Proving Meters, now used in the State of New York in compliance with an Act of the Legislature.**

ALSO, BUNSEN'S PHOTOMETER, WITH COMPLETE APPARATUS FOR WORKING THE* SAME

* The standard of measurement of this Gas-Holder is given by Professors TORREY, of the U. S. Assay Office; JOY, of Columbia College; GIBBS, of the Free Academy, and several other distinguished scientific gentlemen.

# CODE, HOPPER & GRATZ,

1500, 1502 and 1504 FILBERT ST., PHILADELPHIA.

MANUFACTURERS OF

**Pressure Registers, Pressure Indicators, Pressure Gauges, Photometers, Governors, Station Meters, Customer Meters, (Wet and Dry,) Experimental Meters, (Wet and Dry,) Show Meters, (Wet and Dry,) Meter Provers, Centre Seals, &c.**

The high reputation which we have enjoyed for more than twenty-two years, and the fact that we have manufactured a greater number of Gas-Meters than all other manufacturers in this country combined, must present itself as a security to parties desirous of securing the most reliable instruments. Having completed a most extensive addition to our Factory, and added many important improvements to our machinery, we are enabled to fill orders entrusted to us with despatch, and in all cases *guarantee entire satisfaction.* Our Patent Rotary-Valve Dry Gas-Meter is now used by upwards of Two Hundred Gas Companies, giving general satisfaction; we therefore recommend it, believing it superior to any other Dry Gas-Meter manufactured. All Meters tested separately by a sworn Meter-Inspector, and sealed when desired.

# JOHN J. GRIFFIN & CO.,

**76 WEST THIRTY-SEVENTH ST.,**

NEW YORK CITY,

## MANUFACTURERS OF WET AND DRY GAS-METERS,

**Station-Meters, Proving-Machines, Show-Meters, Test-Meters, Pressure Indicators, &c.**

All of our Work is Guaranteed to be of the First Quality, as well as the material, and for this we can refer to numerous Gas-Light Companies.

# JOSEPH LENNIG & CO.,

**Nos. 313 & 315 NEW MARKET St., above Vine St., Philadelphia, Pa.,**

MANUFACTURERS OF

**Wet and Dry Patent Gas-Meters, Station, Show, Customer, and Experimental Meters, Photometers; Pressure-Registers, Indicators, and Gauges; Governors, Meter-Provers, Centre-Seals, Fluid Gauges, &c.**

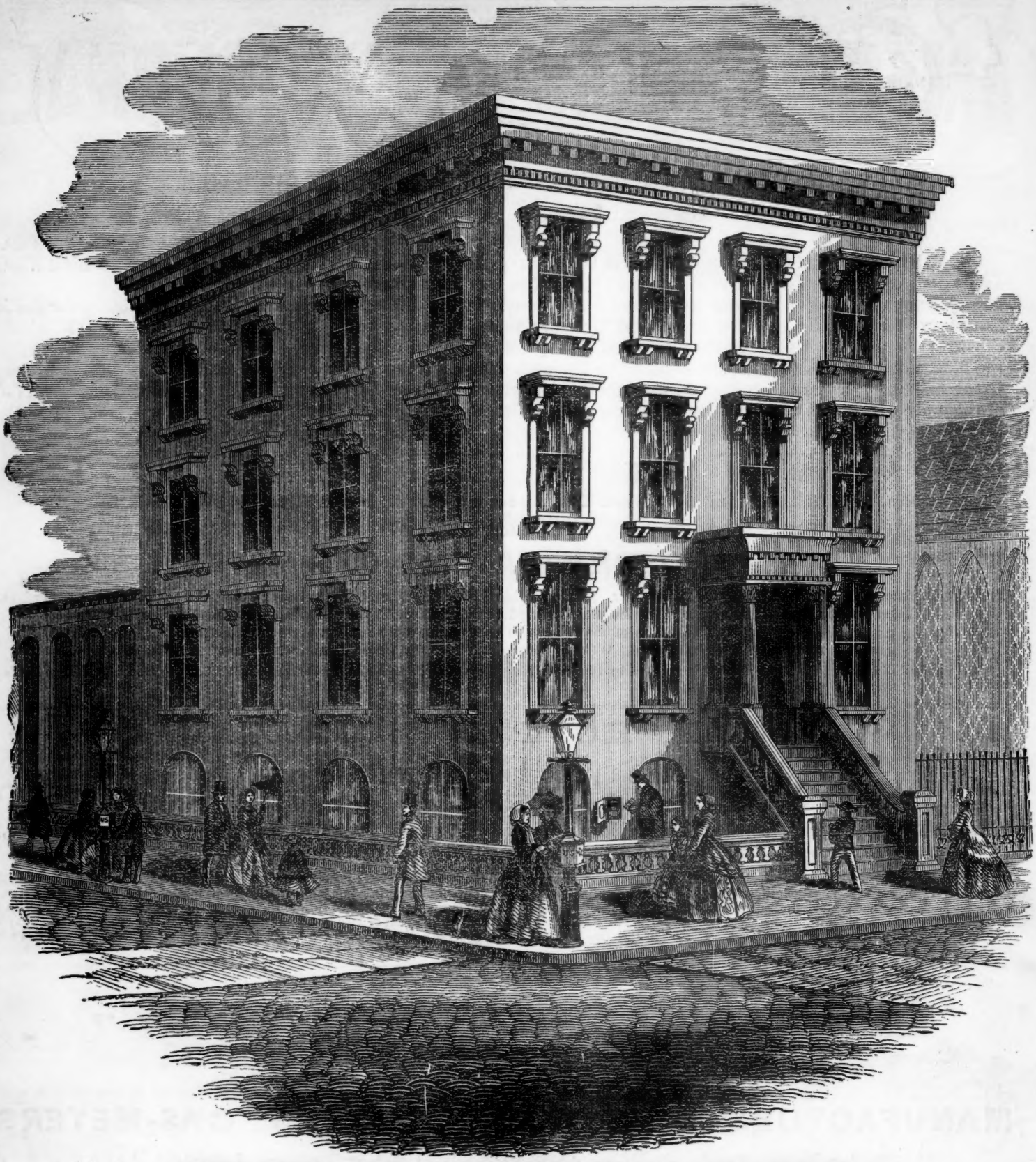
The flattering Testimonials we are receiving from Gas Officers, accompanied with expressions of such general satisfaction, and the fact of a tried experience for fourteen years, must present itself as a security to parties desirous of securing the most reliable Instruments. We therefore recommend our Patent Dry Gas-Meter, believing it superior to any Meter manufactured. Messrs. J. LENNIG & Co. confine their sole attention to the business of GAS-METER making.

Our materials are the best in use; the strictest attention is given to workmanship, and we guarantee entire satisfaction to all purchasers.

Purchasers may at any time inspect our Works, and the materials of which our Meters are manufactured. We are fully prepared to execute all orders, upon the shortest notice, and it will be to the interest of parties to call upon us.

☞ **Each Meter Tested Separately by a Sworn Inspector, and Sealed when desired.** ☜

METERS REPAIRED AND FORWARDED WITH DISPATCH.



## THE TWO GREAT PATENTS OF THE DAY.

# 1.—Improved Mode of Setting Gas-Meters in the Walls of Buildings.

# 2.—Cast-Iron Mail-Stations for Public Lamp-Posts.

Adopted by the UNITED STATES GOVERNMENT for the Principal Cities.

**ALBERT POTTS, Philadelphia, Patentee.**

By the FIRST IMPROVEMENT the Meters may be inspected at any time from without, by the agents of the Gas-Company having keys for that purpose. Thus burglars need no longer gain admittance to dwellings under pretense of examining the meters, while they, in fact, examine the fastenings. The meter-box, being neatly and securely imbedded in the front wall, the meter is protected against frost by means of a thick pad on the back of the door. It has been satisfactorily tested in long continued severe weather and found to be eminently successful.

The SECOND IMPROVEMENT speaks for itself. The cities of New York and Philadelphia are already supplied with these boxes, and the convenience to the citizens and increase of revenue to the Post Office Department are most marked. Always in sight, securely fastened to the most public objects, protected by light, day and night, they have become the most popular of all modern improvements and will be immediately adopted throughout the country.

Both of these improvements are to be seen at the Rooms of the AMERICAN GAS-LIGHT JOURNAL, New-York City. For further information address the Proprietor of this JOURNAL, who is authorised to contract for the use of both Improvements, or

ALBERT POTTS, Philadelphia.